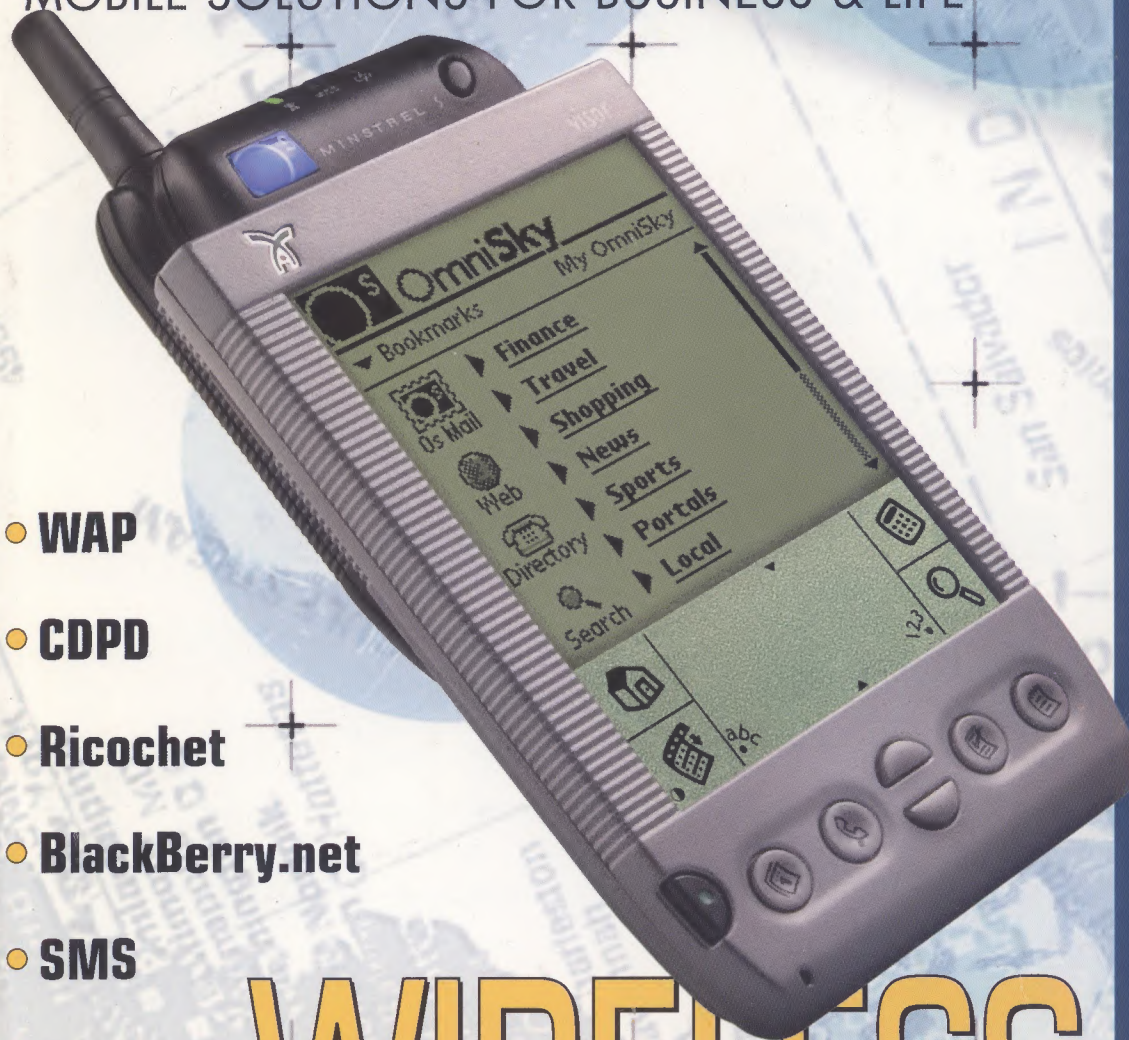


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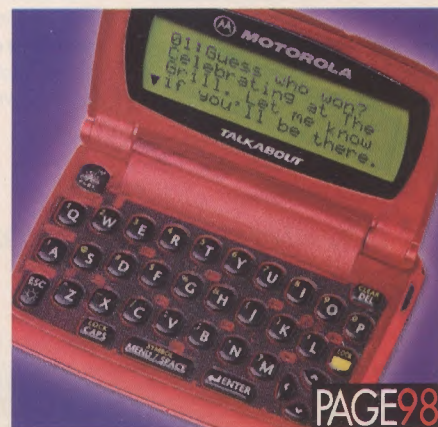
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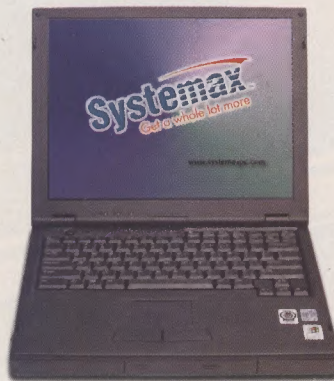
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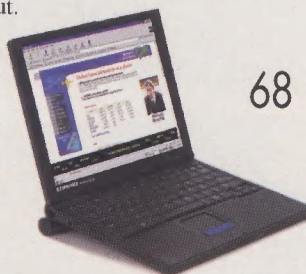


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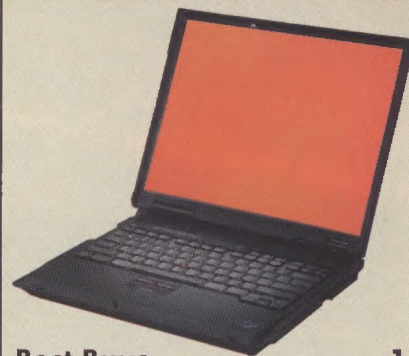
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- 128MB SDRAM ■ 10GB³ Ultra ATA HD
- 16MB ATI Rage Mobility™-M4 3D[®] Video, 4X AGP
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FROM THE EDITOR

3G—Wireless Promises Fulfilled

We often feel a rush of excitement when we hear of a new technology that seems ready to propel us to a new level of achievement. We felt that rush a few years ago, when we first heard about Wireless Application Protocol, or WAP. This protocol, developed by an industry consortium, allows us to access the Internet from a WAP-enabled handheld, PDA, or cellular phone. The Internet had already become so important that people were looking for an easy way to carry it with them.

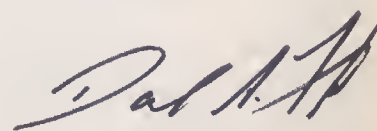
There are two problems with WAP today. The first, and easiest to solve, has to do with expectations. WAP lets you access the Internet from a handheld device. What you actually get bears little resemblance to your standard Internet experience. There are no graphics, no color, just lines of text. It takes lots of scrolling to get through even a simple page, and lots of key tapping to type in a URL or any other data.

The second problem with WAP is that most WAP-enabled sites are reworked versions of standard Web pages rather than Web content redesigned for the bandwidth and form factor of handheld devices. So, even though many sites are accessible via handheld, few provide a satisfying experience. There is often lots of drilling down through menus, and lots of waiting for information to come through.

The wireless Internet is most popular in Japan, where over three-quarters of all users are currently based. Most use the incredibly popular iMode mobile Internet access and m-commerce service from NTT DoCoMo, with another large percentage using WAP. In Europe, despite the large number of cellular phone users, the frustration of using WAP has kept people away. Short message service is the big thing there.

The real promise of the wireless Internet is still ahead. Within the next year, the third-generation wireless standard, called 3G, and the services it will bring with it, should be available. The various wireless standards are set to coalesce around 3G, and many bandwidth problems are to be solved. The 3G experience is touted as being much closer to a traditional Internet experience, including streaming media.

With 3G, we will be able to videoconference, download video presentations, and access other high-bandwidth services. We'll be able to interact with smart devices at home and at work, even when we're somewhere else. We will be several steps beyond simple Web browsing. That's certainly worth waiting for. If it all works as advertised, 3G should be the promise of the mobile Internet fulfilled, and maybe a bit more. It will take us to the next level of Internet use, and it can't come soon enough.



DAVID A. FINCK
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The keys use a 3V lithium battery that lasts up to 5,000 openings and can recognize up to 700 locks and 50 access schedules. The key and cylinder each hold approximately 1,100 events. The software handles, distributes, and logs access information, plus personal information about the key holder—even a picture!

The starter kit, which includes one cylinder, two keys, the CyberBase, serial cable, and a fully functional demo of CyberAudit software, costs \$582.

Videx; (541) 758-0521;
www.videx.com.



GET IT TOGETHER

If you're like most people, your computer bag is probably a jumbled mess. In this mobile age you most likely carry not only a laptop, but also a cell phone, PDA, MP3 player, and let's not forget about the dinosaur-age paperwork one still must endure.

If this sounds familiar, the MegaBag from RoadWired might be a sound investment. It has 36 separate compartments. The main compartment protects sensitive equipment with a shock-absorbing foam interlining, and is adjustable by adding

or removing extra padding.

Other subsections are easily reached from above, and are ergonomically laid out to help you organize everything from business cards and floppy disks to a digital camera and cables. Other features include a hidden pocket where you can safely stash credit cards, cash, or your passport.

The MegaBag boasts comfortable straps, sag-free construction, and quick release closures. It is available in black-on-

black or titanium-on-black. The water-resistant MegaBag can be yours for \$179.

RoadWired; (877) 435-5679; www.roadwired.com.



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With the Picture-in-Picture feature, computer and video images can be shown at the same time, eliminating the need to embed video clips in PowerPoint slides. The last image on the screen can be frozen, giving the presenter enough time to change the video or computer application. The projector, which comes with a remote control, allows for mouse control, zooming, and focus, and includes a built-in laser pointer.

At \$6,299, the MP-650i is backed by a 30-day money-back guarantee, a two-year parts and labor warranty, and a four-month lamp guarantee.

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FlipBrowser Gold requires Windows 95/98, NT, or 2000 and Internet Explorer 5.01 or above. The full version is available for \$19.95 at the company Web site. The FlipBrowser viewer is free at the same address.

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Decades ago, when vinyl records and tape cassettes ruled the audio world, choosing your listening format was simple. You had two choices, and you lived with them. Today, it's more complicated. You must distinguish between audio



CDs, CD-Rs, CD-RWs, and MP3s, while making sure you have the right equipment to play it all. Sometimes, it seems, listening to music has become much harder than it ought to be.

Mambo Digital apparently agrees. Regardless of your format preference, the Mambo-X P300 Portable MP3 CD Player will support it. The P300 just as eagerly plays MP3s as it does regular audio CDs, and without a PC or Internet link. It eliminates Flash memory from the equation and lets you listen to MP3 files on CD.

Other P300 features include a wide sampling rate, spanning between 32 and 320 Kbps, and relatively low power consumption, which lets it run for close to ten hours on two AA batteries. It can be used in a car through a cigarette lighter or cassette player adapter, has a remote control for track selection, and an antishock absorption system for smooth playing. It costs \$179.

Mambo Digital; www.mambox.com.

NOT JUST FOR MUSIC

Instead of reading documents on your computer, listen to them. With TextAloud MP3, a Windows application from NextUp Technologies, you can save e-mail, Web pages, or text from any document in spoken words as an MP3 file.

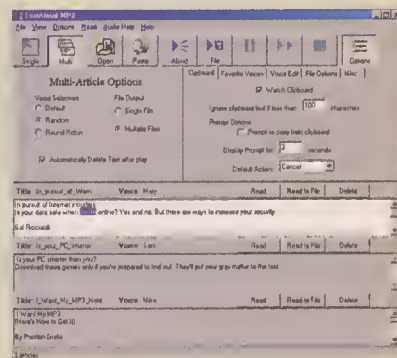
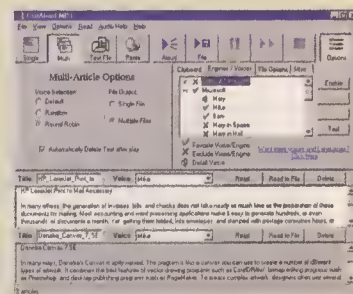
Instead of listening only to music on your portable MP3 player, you can download and listen to work information or a friend's e-mail.

The text is played back in a natural-sounding human voice—choose among more than 24 voices and seven languages. You can also decide between a male or female voice, the voice pitch, and the reading speed.

Whether you listen to the files immediately or save them for later, you will find the VCR-like controls easy to maneuver. Words can be added to TextAloud MP3's dictionary, and word pronunciation can be changed.

You can buy TextAloud MP3 from the company Web site for \$19.95. A trial version is also available.

NextUp Technologies; (336) 998-1882; www.nextuptech.com.



WRITE IT, SNAP IT, SEND IT

Pen and paper have come a long way.

The Ericsson Chatpen, expected to hit the market later this year, will let you send handwritten faxes, e-mail messages, and even graphical SMS messages from anywhere. Using Anoto technology and digital pattern paper, as well

how it uses Anoto's digital paper pattern. As you write, the pattern is recorded by a digital camera inside the pen. Once you've completed your message, the image is processed and sent to your phone or PC, which relays the information to the Anoto Name Server. The server then delivers your



as a Bluetooth transmitter, the Chatpen will connect through any nearby Bluetooth-equipped device. Your mobile phone, for instance, could propel your pen and paper messages wherever you need them to go.

The Chatpen's trick is in

message or graphic wirelessly to whomever you directed it.

Sound complicated? The technology is. Users, however, need only be astute enough to operate an otherwise regular pen and check a command box

labeled "send."

Pricing has yet to be determined, but more information on this product can be found

at Ericsson's Web site.

Ericsson Mobile Communications; www.ericsson.com.

mobileplanet.
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For cutting-edge mobile computing and wireless products, solutions and expertise, visit MobilePlanet.com. From our comprehensive online web stores such as Wireless Data Store, Pocket PC Store, Mobile Solutions Center and Palm Paradise, to our renowned catalog and knowledgeable sales and customer service team members, you will find the latest and greatest selection of wireless and mobile computing products available.



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The recording capacity of HF-Memo is five minutes. After you exceed the limit, new messages immediately replace the oldest ones.

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Emjei Corp.; (847) 518-9070; www.hf-memo.com.

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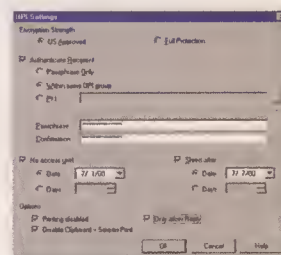
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Many encryption programs protect e-mail documents in transit, but what happens once they are received? They are no longer protected, and you don't know who is looking at them. Enter e-OPI.

Developed by WinVista, e-OPI—Electronic Office document Protection Interface—protects electronic information throughout its lifecycle. e-OPI adds encryption methodology and embeds controls within MS Office documents. This method makes the protection a part of the document and protects it from start to finish.



e-OPI includes a full range of author-configured controls, such as user-authentication methods, document-alteration protection, embargoes, document-expiration dates, print restrictions, cut/copy/paste and screen-capture disabling, and a Signed When Delivered feature, which ensures that the data is linked to a single PC. Creating an e-OPI document is easy. You simply click on a button within the MS Office command bar to activate the application.

e-OPI costs \$69.

WinVista Corp.; (561) 362-6030; www.e-opi.com.



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EYE ON TECHNOLOGY

Dispatches from the Cutting Edge

AVerMedia AVerKit 2.5"

Many more laptops, and for that matter, desktops, are being provided with an IEEE-1394 (FireWire) port. The reason is simple: speed. IEEE-1394 is a fast interface—much faster than serial, parallel, or USB.

The AVerKit 2.5" is a small, translucent gray box, not much larger than the 2.5-inch hard drive that fits inside it. It comes with a 6-pin 1394 cable, a small carrying case, an installation CD, and drivers for the Mac OS. Windows 98, Me, and 2000 already support 1394, so no drivers are necessary. No power cable is included. A 6-pin 1394 port provides power from the notebook.

Installing the drive in the case took only about a minute. We had a 1.5GB IBM TravelStar drive on the test bench from a previous upgrade. We simply removed three screws from the AVerKit's case to disassemble it, inserted the drive into the connector on the circuit board inside the case, and reassembled the case. The AVerKit drive is hot pluggable, and the operating system should recognize it as soon as you plug it into a laptop.

We tested the AVerKit 2.5" with a Dell Inspiron 8000, an 800-MHz Pentium III laptop. Transferring 605MB (202 files in 38 folders) from the Dell's hard drive to the AVerKit 2.5" took only 2 minutes and 39 seconds. AVerMedia claims transfer rates of up to 400 Mbps, about 50 MB/sec. Our test showed a much slower transfer rate, about 3.8 MB/sec.

While the AVerKit 2.5" works much as advertised, there are some potential (and possibly unavoidable) pitfalls with the device. In theory, once the drive is installed, setting it up with the laptop should be a simple Plug-and-Play operation. However,

a growing number of laptops (such as the Dell Inspiron 8000) use a 4-pin 1394 port. This port is considerably smaller than the 6-pin cable that the AVerKit supplies, and does not provide power through the interface. There was no mention of any potential incompatibility in the sparse documentation that comes with the kit.

This difference in connectors created two problems: how to connect the AVerKit 2.5" and how to power it. We happened to have in-house an appropriate cable with six pins on one side (to fit the AVerKit) and four pins on the other (to fit the Dell), but with this type of cable, the drive doesn't work because it's not receiving any power. There is an input for DC power in the 12- to 21-volt range, but again, no mention in the documentation of when it might be necessary to use this jack or where to obtain the needed AC adapter. We have a RadioShack universal power supply that we use in these situations, but some users might not know where to turn.

Our other problems with the AVerKit are somewhat more conceptual. The first concerns where you will get the drive that you have to install in the AVerKit. The \$149 purchase price covers the enclosure and cable, but not a hard drive. If you need to purchase a brand-new drive to install in the enclosure, the AVerKit makes little economic sense—you can purchase complete and assembled external portable hard drives, even FireWire models, for about the same price as an AVerKit/hard drive arrangement.

Another consideration is exactly



what you expect to accomplish with the newly assembled external drive. Having an external drive is handy in several situations, such as being able to back up an entire hard disk quickly, or when you have extremely large files, such as MPEG-2 video, to move from one system to another.

While this type of application does provide justification for an external hard drive rather than the more useful, but lower capacity and slower, CD-RW drive, there is an increasing number of vendors providing these drives as turnkey units. Just take them out of the box and plug them in.

The AVerKit 2.5" makes a lot of sense if you've recently upgraded the hard drive in your laptop and you have a moderately large 2.5-inch form factor drive that you removed during this upgrade. The AVerKit 2.5" will allow you to reuse this old drive at a reasonable price.

AVerKit 2.5"

Price: \$149

Company: AVerMedia Technologies, Inc.
(800) 863-2332

www.aver.com

Compaq MP2800 portable projector

We don't usually drool over multimedia projectors—but Compaq's MP2800 DLP-based portable projector is worthy of such adoration. This unit is smaller and lighter than Compaq's previous top-of-the-line ultralight models, yet it maintains the brightness of a DLP unit, projecting an image that's visible even in daylight settings. And, it looks great!

In years past, mobile presenters had to lug 10 to 20 pounds of gear to put on a computer-based slide show or video presentation. Today, you can mate the three-pound MP2800 with an ultralight laptop to create a six-pound presentation system. Lightweight, small, and easy to carry makes for a winning combination—that is, assuming you can afford the \$4,999 purchase price.

Like Compaq's previous top-of-the-line ultralight projector, the MP2800 stands vertically, so it minimizes keystoneing of the projected image, and it requires less space on the meeting room table. A retractable, swiveling foot keeps the projector stable and lets you adjust vertical orientation. There are only three ports on the main unit—power, VGA, and DVI. These are all you'll need if you're using the unit with a laptop.

Some users, however, will want to use the projector with a standalone presentation product (VCR, DVD, etc.). A video module clips on the back of the unit and features video-in (RCA port), audio-in, and S-Video-in. The video module also includes a built-in speaker and a port for a remote mouse. It clips on the rear of the unit, connecting with the DVI port.

In action, the unit is impressive. It is considerably quieter than most projectors. It projects 900 lumens of light and has a throw (distance from projector to screen) of up to 32.8 feet in almost any lighting condition.

Native resolution is XGA (1,024 x 768) but the projector scales smoothly to SXGA, SVGA, VGA, and the 832 x 624 Mac format.

It sets up quickly and easily. It includes a remote control that lets you adjust a wide array of settings, including zoom, volume, brightness, contrast, vertical and horizontal adjustments, and keystone. It has a manual-focus lens and five buttons on top for adjusting settings.

We found the MP2800 easy to use with a wide variety of video sources, including a laptop computer, VCR, digital camcorder, and even a television tuner. In each case, the projector recognized the available video source with no problems.

The laser pointer built into the remote

when plugged in.

The projector's magnesium casing is rated 20 percent stronger than plastic, yet 30 percent lighter than aluminum. The ruggedness makes it possible to leave the projector's carrying case at home and tote the projector in the same carrying case as your laptop. It's not as well protected there, but your entire presentation kit will be that much lighter and more compact.

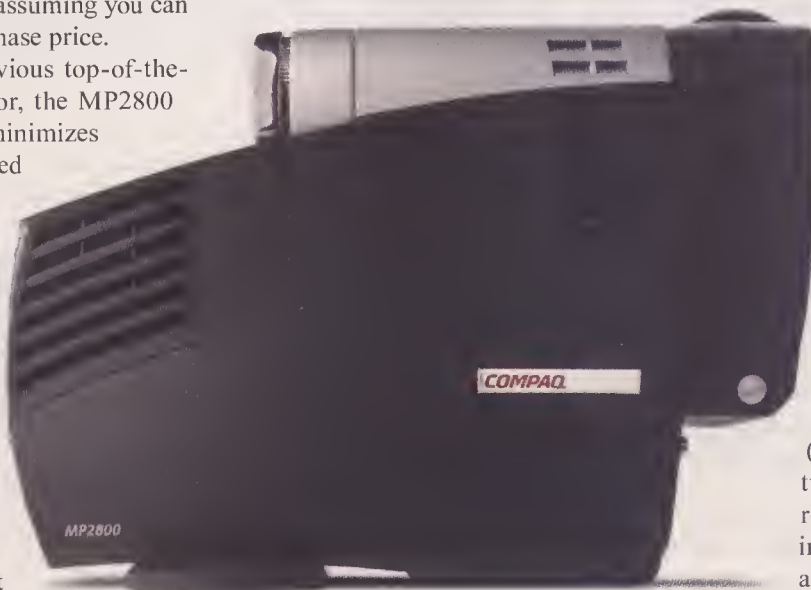
Inside, the unit uses Texas Instruments' Digital Light Processing (DLP) technology with a single Digital Micromirror Device (DMD). A DMD has thousands of tiny microscopic mirrors that tilt to reflect colored light through the lens to create the image. Although more expensive than LCD-based systems, DLP technology generally provides brighter and crisper images and does so in a smaller and lighter form factor.

An innovative feature of the MP2800 is its quick-change lamp, housed in a disposable casing that is easily removed as soon as the lamp goes out. Rather than having to wait for a burned-out lamp to cool (while audience members twiddle their thumbs), you can remove the casing and replace it in seconds, saving your fingers as well as your presentation. It's

one more area in which Compaq

paid an enormous amount of attention to detail and considered the projector's use in difficult, real-world scenarios.

The MP2800 weighs three pounds and measures 2.7 x 8.7 x 7.1 inches (WDH). It is covered by a two-year worldwide limited warranty. This projector's combination of power, portability, and innovative industrial design make it an absolute winner in almost every way.



control is a fine presentation tool. An infrared port (for the remote) is well positioned on top of the unit. The projector's vertical orientation positions the IR port above most other items on the table, providing a better line of sight for the remote.

Compaq paid a lot of attention to detail in designing this projector. Even the included carrying case is lined with lightweight, protective foam to safely cushion the projector. A removable external mesh utility bag holds all the required cables. International travelers will be happy to note that the MP2800 automatically adjusts to the local voltage

MP2800 portable projector

Price: \$4,999

Company: Compaq Computer Corp.

(800) AT-COMPAQ

www.compaq.com

MusicMatch Jukebox 6.0 Plus

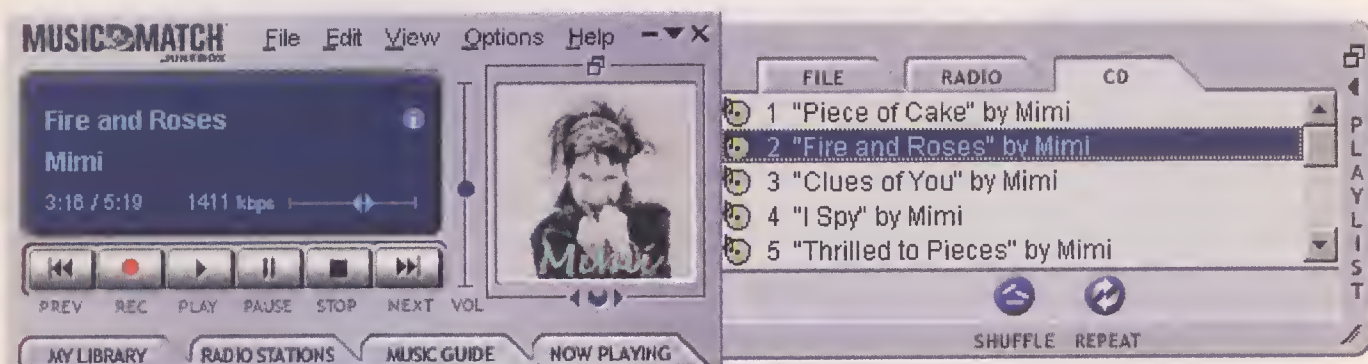
Currently, there are lots of media players on the market, spurred on by the popularity of online music and portable MP3 players.

Most of these media players, including Winamp, Microsoft's Media Player 7, and RealPlayer, are free downloads. MusicMatch Jukebox 6.0 is also available

The most substantial addition to this version of MusicMatch Jukebox is the MusicMatch Radio. With 18 predefined radio stations, this feature pumps your choice of music over the Internet. You can create custom "stations" using a genre of music or particular artist, and the utility will find selections that match

to display the current artist, and the ability to print customized CD jewel case inserts and playlists by track, artist, album, or other criteria.

We like MusicMatch Jukebox 6.0 very much. It's chock-full of features and easy to use. The Internet Radio capability is a significant and enjoyable upgrade.



as a free download, but we tested the "Plus" version of the utility, which has a \$19.99 registration fee. It adds a number of useful features.

MusicMatch Jukebox has been one of the more successful players. As with the previous version, and like most of the other player utilities, you can create multiple playlists from songs that you've downloaded from the Internet or encoded from your own audio CDs or analog sources.

The process of encoding music is called "ripping," and MusicMatch Jukebox 6.0 allows you to rip tracks and save the resulting files in a number of formats, including WAV, MP3, or WMA (Windows Media). The resolution of the file, or how often it is sampled during the rip, can be set in the Options menus, and depends on the file format.

As you could with the previous version, you can record directly to CD-Rs using the MusicMatch 6.0 utility. There is a comprehensive set of controls, and recording takes place at the limit of the CD burner's capability. We recorded a 701MB CD in 19 minutes, about the same time it would have taken using the Roxio Easy CD Creator software included with our I/OX HP CD-Writer Plus drive.

your criteria, and create custom playlists. A music guide, with information on the artist, album, and selection, can be displayed as the music plays.

A MusicMatch Radio announcement plays after every five selections. That is a bit annoying, but it gives the utility some time to buffer the music. We connected over a broadband connection, which is the best way to use this utility; 56-Kbps modem connections are also supported.

With our fast Internet connection, music played smoothly, with no breakups or hesitations. Most of the time it was like listening to a high-quality audio CD. A ten-band equalizer lets you customize the sound to your equipment. As with many utilities, you can change the appearance of the software with customized "skins." Several skins are included, and more are available at the vendor's site.

All of the features we've described thus far are available in the standard version of MusicMatch Jukebox 6.0, which is free. At almost 8.5MB, it's a fairly long download unless you have a broadband connection.

The Plus version of MusicMatch Jukebox 6.0 provides an unlock key that adds some features to the player. These include a faster encoder, the ability to dynamically alter the desktop wallpaper

The standard version is definitely worth the download.

Whether or not the upgrade to the Plus version is worth paying \$19.99 depends largely on what other software you have. After the upgrade, the encoder ripped our songs a bit faster, but it was pretty fast to begin with, thanks to our high-speed CD-RW drive.

The integrated jewel case and label printer is mainly what your upgrade dollars are paying for. If you've bothered to download the album artwork when building your playlist, you can easily, by clicking one button, build a collage of these album covers for the front of your jewel case. The back is, by default, a playlist with the track title, artist, and track time.

You can do all this with any good CD label creator utility. It is, however, a very simple process using the enhanced features of MusicMatch Jukebox 6.0 Plus. It's well worth the \$19.99 registration fee if you'll be burning more than just a few CDs.

MusicMatch Jukebox 6.0 Plus

Price: \$19.99 (standard version is a free download)

Company: MusicMatch, Inc.

(858) 485-4214

www.musicmatch.com

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¹Titanium Composite Carbon Fiber Reinforced Plastic has three times the strength of ABS plastic as tested by IBM using the high flex modulus test on 2/28/00. Available on select models. ²MHz/GHz only measures microprocessor internal clock speed; many factors affect application performance. For mobile Intel Pentium III processors featuring SpeedStep technology, this denotes maximum performance mode; battery optimization mode is approximately 80% of maximum performance mode. ³GB equals one billion bytes when referring to storage capacity; accessible capacity may be less. ⁴CD-RW, DVD-RDM and CD-ROM drives list a variable read rate. CD-RW write and re-write speeds vary and list only the maximum possible. Actual CD-RW, DVD-RDM and CD-ROM speeds will vary and are often less than the maximum possible. The read and write results of the CD-RW drive depend on the quality and characteristics of the CD-R and the CD-RW media used. Poor results may be obtained with some media suppliers. ⁵Designed to be capable of receiving at up to 56Kbps with compatible phone line and server equipment, and transmitting at up to 31.2Kbps. Public networks currently limit maximum download speeds to about 53Kbps. Actual speeds depend on many factors and are often less than the maximum possible. ⁶Some software may differ from its retail version (if available), and may not include user manuals or all program functionality. For non-IBM software, applicable third-party licenses may apply. Warranty, service and support for non-IBM products, if any, are provided by third parties, not IBM. IBM makes no representations or warranties regarding non-IBM products. ⁷Weight may vary due to vendor components, manufacturing process and options (includes optional travel bezel on A and T Series). Weight includes battery. ⁸For terms and conditions or copies of IBM's Statement of Limited Warranty, call 1 800 772-2227 in the US and in Canada call 1 800 426-2255. Limited warranty includes International Warranty Service in those countries where this product is offered. Telephone support may be subject to additional charges. ⁹Pricing shown is price available from IBM directly; reseller prices may vary. IBM price does not include tax or shipping and is subject to change without notice. ¹⁰SuccessLease is offered and administered in the US, Canada and other countries by third-party providers of business financing approved by IBM Global Financing. SuccessLease terms and conditions provided by the third party. Featured monthly lease payments are based on a 36-month term with prespecified purchase option at the end of lease, to qualified business customers only, installing in the US. A documentation fee and first month's payment due at lease signing. Any taxes are additional. Other lease terms and structures are available. Offer may be withdrawn or changed without notice. Options listed cannot be leased separately from system unit. ¹¹Results based on BAPCO's (Business Applications Performance Corporation) SYSmark benchmark test. Battery life and recharge times will vary based on many factors including screen brightness, applications, features, battery conditioning, power management and other customer preferences. IBM reserves the right to alter product offerings and specifications at any time, without notice. SuccessLease and all IBM product names are registered trademarks or trademarks of International Business Machines Corporation. Lotus and SmartSuite are registered trademarks of Lotus Development Corporation, an IBM company. Intel, the Intel Inside logo and Pentium are registered trademarks and Celeron and SpeedStep are trademarks of Intel Corporation. Microsoft and Windows are registered trademarks of Microsoft Corporation. Other company, product and service names may be trademarks or service marks of others. ©2001 IBM Corp. All rights reserved.

ZoneAlarm Pro

The corporate sector has long known the value of a good firewall. But in situations where the on-again, off-again nature of dialup access provides the illusion of security, many users are actually quite vulnerable. When such users upgrade to an always-on connection, they take their illusions of security with them. Small and home offices have never been in greater need of high security on the Internet.

That's where Zone Labs' ZoneAlarm Pro enters the picture. ZoneAlarm Pro is a software firewall application designed to run on individual computers. It works on systems connected to the Internet via broadband or dialup at home or in a small office, as well as on systems connected to the Internet through a corporate LAN.

The core functionality of ZoneAlarm Pro is basic firewall protection. The software plugs up the most notorious holes in the Windows family of operating systems. For starters, it secures your operating system's ports and shuts down Windows' built-in personal Web server.

Direct computer security breaches over the Internet are not the only threats, however. While many firewalls always track incoming traffic, some do not check your programs that go out over the Internet. This is a major flaw, since you can inadvertently download a program that turns out to be a Trojan Horse. It looks like a game, or animation, or other silly little program. In reality, it silently opens up your system to attack and alerts the would-be attacker—all from the inside!

ZoneAlarm Pro addresses this problem by asking you for permission when an application wants to connect to the Internet. After you install the software, you'll be prompted every time a new program wants to use the Internet (your Web browser, your e-mail program, etc.) Once you confirm that it's okay, ZoneAlarm Pro remembers it and doesn't ask again. If a program you don't recognize tries to access the Internet, you simply don't authorize it.

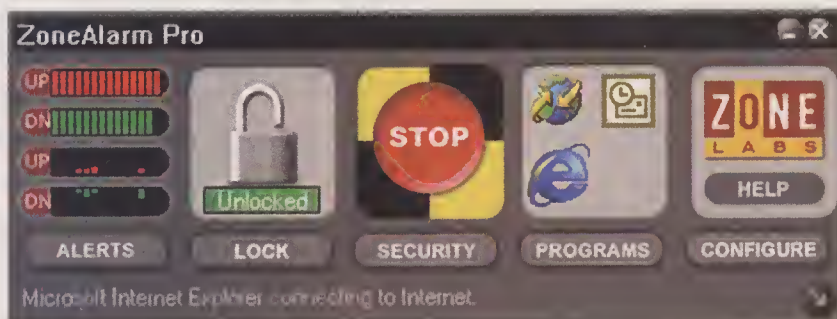
As with every firewall program, you

must weigh security against inconvenience. The more secure you want to be, the more inconvenience you may have to tolerate. For example, if you set ZoneAlarm to High Security, you can expect to be interrupted a little more often—in many cases when there is no actual threat.

Since ZoneAlarm Pro is also designed for use in corporate LANs, it must be able to dynamically alter its settings depending upon who is accessing it. For example, you might want to provide access to one of the folders on your computer to other computers on your LAN, but not

All in all, we found ZoneAlarm Pro to be a great product at a great price. Although it is designed for both individual machines and network configuration (bulk pricing is available), a free version (ZoneAlarm) is available for personal and non-profit use. It has similar features and capabilities, but does not support network installations.

According to Zone Labs, the free ZoneAlarm software has been downloaded by over eight million users. The company has used feedback from these customers to refine and develop the technology used



to the Internet. ZoneAlarm Pro's zones feature lets you specify different security levels for different zones (Internet, LAN, etc.)

There are a number of other features we liked. For example, the program includes a feature called Internet Lock that allows you to lock out any Internet communication with a single click. For the utmost security when away from your desk (short of turning off your computer or disconnecting from the network), this is a great tool. ZoneAlarm Pro can put access to these tools within one-click reach by placing a ZoneAlarm toolbar on the bottom of your screen.

If you wish, you can get down and dirty with ZoneAlarm Pro and alter the permissions for individual programs. For example, you may need to run a Web server for a few hours to test some software. ZoneAlarm Pro makes it easy to open up access to the server, and close it off again later. The ZoneAlarm Pro package also includes MailSafe, which weeds out virus-infected e-mail attachments.

in the latest versions of both ZoneAlarm and ZoneAlarm Pro.

To see ZoneAlarm Pro in action, hop over to the Shields Up! Web site provided by Gibson Research Corporation. (Point your browser to www.grc.com and follow the links to Shields Up!) Test your system's shields and probe its ports both before and after installing ZoneAlarm Pro. You will likely notice a big difference.

ZoneAlarm Pro is compatible with Windows 95/98, Me, NT, and 2000. While a firewall is essential for an always-on connection, such as DSL, cable, or corporate LAN (T1, etc.), it is also highly desirable for dialup use. Even though you're online for shorter periods of time, someone can gain illicit access to your computer over a dialup connection. It's trite, but true: better safe than sorry.

ZoneAlarm Pro

Price: \$39

Company: Zone Labs, Inc.

(415) 341-8200

www.zonelabs.com

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SPOTLIGHT ON SOFTWARE

Many Happy Returns

Tax-Preparation Software

Whether for business or individual returns, any tax package can make filing easier. A third player has joined the industry's two stalwarts, but no matter which you choose, it's hard to go wrong.

by Ted Needleman

It's time to render unto Cæsar. The commercials for tax-prep services try to inject a little humor into this painful annual experience. Chuckles prompted by their TV spots catch in our throats as we realize that we, too, will soon be sorting through shoeboxes of receipts and cancelled checks.

If you'd rather have a root canal than do your tax return, it's easier than ever to let your PC help you numb the pain. Tax-prep software is readily available, both in traditional boxes and from online services. In some cases, it's even free.

While software gets better and easier to use every year, it's not the best choice for everyone. Tax software is designed to meet the needs of "most" users, not those with special situations. If you are used to preparing your own taxes by hand, you'll find tax-prep software an immense help. For complex issues, however, it is no substitute for a trained tax professional.

Try it yourself, and if you run into difficulties, consult an expert. At the very least, your tax professional will appreciate the organization that a tax

software package will bring to your material, and may even reduce your prep fee.

Still the Most Popular

As in years past, the two major contenders for your tax-software dollars are Intuit's Quicken TurboTax and H&R Block's TaxCut.

A third vendor, 2nd Story Software, is starting to make its presence felt with TaxACT. The company was founded by former members of Parsons Technology's Personal Tax Edge Team, and it offers the basic software for free, charging you only for advanced features or complex returns.

Microsoft, which entered the 1040 tax-prep arena last tax season with great fanfare, has quietly folded its tent. Last year, Redmond introduced a package for federal 1040 returns only, which effectively kept it out of the running in the majority of states, which also have state, and sometimes municipal, tax returns. This year, Microsoft has sold its technology to Orrtax, which offers software to many professional tax preparers, including a large number of H&R Block franchisees.

With the rising popularity of the Internet, a host of new online tax-prep sites is available, and several older sites have disappeared. The Thomson Company has discontinued its OneTax.com site, while SecureTax.com, which was a division of Universal Tax Systems, was sold to Intuit and discontinued in favor of Intuit's own Web TurboTax. This year, several professional tax-software vendors are joining the fray, offering online tax prep directly to the consumer.

We examined early versions of the three in-house software packages from Intuit, H&R Block, and 2nd Story Software. None of the online services had yet been activated. We detailed those services from information the vendors supplied.

REVIEWS

2nd Story TaxACT 2000

In the late eighties and early nineties, Parsons Technology sold a terrific tax-prep package called Personal Tax Edge. When Intuit purchased Parsons, the tax

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Ultra-fast, Ultra-strong, MicroLite

The New MicroLite from The Brick Computer Co... 4.2 lbs. of pure convenience

Like all of The Brick Computers, the new MicroLite takes advantage of magnesium alloy construction and the fastest Intel micro PGA (uPGA) processors to keep the weight down and the power up. This new single-spindle superstar weighs in at a phenomenally low 4.2 lbs. and only measures 12" x 9.2" x 1.1", not much more than that date book you've been lugging around for years. For the optimum muscle machine, add the two-spindle UltraBase, flip the lever and you have a real go-anywhere convertible with two additional bays for drives or CD-ROMs.

Try it out for size. You've never experienced so much power from such a lightweight... the MicroLite from The Brick Computer Company.



The snap-in UltraBase adds two bays. The first bay allows you to install either a 3.5" floppy, an LS 120 Super Disk, or a 100MB Zip drive. The other bay supports either a 24x CD-ROM, 8x DVD or 4 x 4 x 24 CD R/W.

MicroLite system options:

MicroLite 700MHz Pentium III, 128MB—12GB,
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\$2,195

(shown with optional UltraBase)

The MicroLite includes these standard features:

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- 24x variable speed CD-ROM
- 64MB SDRAM (upgradeable to 320MB)
- 12" x 9.2" x 1.1" compact dimension
- 4.2 lbs. with battery
- 1 Cardbus Slot
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product was dropped. Several of the original Parsons developers founded 2nd Story Software, and TaxACT is the result.

Unlike the competition, the TaxACT 2000 Standard Edition federal program is free. Just sign onto the vendor's Web site and download it. With a price jump to \$9.95, the TaxACT 2000 Deluxe Edition, which we reviewed, adds the ability to generate more than one federal return, in-depth help, and custom printing options. Also included with the Deluxe Edition is the ability to electronically file one federal return for free. Other vendors also offer free electronic filing, but usually you pay a fee up front, and wait for a rebate.

This year, 43 states require a state tax return. This capability is not included in the \$9.95 package, but is available for \$12.95 more per state. While electronic filing is free with the federal package, you'll pay \$4.95 to e-file if you're in one of the 17 states for which the software provides this capability.

Considering that TaxACT is relatively new to the market, it is a remarkably polished product. Given the experience of its founders, that's not surprising. The software installs as easily as the others we tested, and is as easy to use. Well-designed screens walk you through an interview process, filling in the return and required forms as you go. The context-sensitive help is, in many areas, not quite as extensive or fancy as that included with TurboTax or TaxCut, but it should be adequate for most users.

With a "new" vendor, there's always concern that some useful features may have been omitted. That's certainly not

the case here. TaxACT 2000 Deluxe includes advanced features, such as Return Review, which alerts you to forms that are missing required information; a comparison of your figures to National Averages; and a Life Events section that explains how marriage, children, and the like will affect your tax bill.

Based strictly on the number of forms and worksheets it provides, TaxACT 2000 Deluxe comes in third after TurboTax Deluxe and TaxCut. To be fair, however, this will only be germane to the small number of taxpayers who have extremely complex returns. For the average taxpayer, 2nd Story's TaxACT 2000 is a very credible choice.

If you are just getting started on your return with your PC, you might want to download the free version and see if it meets your requirements. If it doesn't, you can always upgrade to the very inexpensive Deluxe Edition. \$10 (Federal), \$13 (State).

H&R Block Kiplinger TaxCut Deluxe

After TurboTax, Kiplinger TaxCut, from H&R Block, is the most popular consumer tax-prep application. Like Ford and General Motors in the auto world, Intuit and Block provide very similar products, and each has a very satisfied customer base. The largest difference is that Intuit leverages its other resources, such as its Quicken financial software and the large number of tax-prep professionals that use its professional software products, to add value to TurboTax.

Aside from a few elements, such as access to a tax professional and the automated data feature that TurboTax

is offering this year, TaxCut Deluxe matches TurboTax Deluxe feature for feature. It is as easy to install and use as any product on the market, and has extensive context-sensitive, multimedia online help. As with the competition, a step-by-step interview leads you through the data-input process, which TaxCut called My Taxes—or you can jump directly to a particular form to put in the information. In a Where Am I? window, you can see a graphical illustration of where you are in the return-prep process; you can keep the window onscreen as you proceed through the interview.

Like the other tax-prep products, TaxCut has excellent import capabilities. If you're switching to TaxCut this year from TurboTax or Microsoft's TaxSaver, you'll find it's just as easy to load information from last year's files as it would be if you had used the TaxCut product. You can also import financial information from Microsoft's Money or Intuit's Quicken.

TaxCut also comes in a version with enhanced features for self-employed individuals. The TaxCut Home & Business edition costs \$50, and provides enhanced assistance in the areas of depreciation and home-office use. Electronic filing is a standard feature of TaxCut Deluxe, and filing the first electronic federal return is free (with a rebate). State returns cost \$7 to file electronically or \$2 if filed along with a federal return.

This year, TaxCut offers Refund Anticipation Loans, which it calls Electronic Refund Advance, for those

electronic filers who have money coming back. This service costs \$30, and can provide access to a refund within two business days of electronically filing a return. Click and Fix lets users audit their returns for omissions and errors before printing or sending them, and an Auto-Update feature allows TaxCut users



to automatically check for and download updates from TaxCut's Web site.

You may find TaxCut Deluxe at a price a bit less than TurboTax, especially when you factor in the state return included with the Kiplinger product. If you can take advantage of Intuit's automated data entry, TurboTax has an edge. If you can't, or won't use this feature, TaxCut Deluxe matches TurboTax feature for feature, and could cost you less. \$19 (*Deluxe Multimedia, includes one state*).

Intuit Quicken TurboTax Deluxe

Not only is Intuit's Quicken TurboTax the best-selling consumer-oriented tax software, it's also one of the best-selling computer applications. This year, as in previous years, Quicken TurboTax is available for Windows-based PCs and Macs, and in several different versions.

The basic TurboTax for Windows covers only federal returns, while TurboTax Deluxe, for Windows and Mac, includes a rebate offer for one state tax program. The top of the line, TurboTax Home & Business for Windows, adds features like the Depreciation Expert and Business Tax Library. These provide additional guidance for self-employed taxpayers with more complex returns.

That doesn't mean you can't prepare the Schedule C (Income From Self-Employment) with the less expensive versions of TurboTax. The proper forms are included with all versions of TurboTax. The more expensive Home & Business version, however, provides a lot more handholding in business-related areas, such as depreciation and property used for personal and business use. We reviewed the TurboTax Deluxe federal package. The state packages were not yet available at the time our reviews were performed.

TurboTax Deluxe installs easily and automatically. If you have a file from last year's TurboTax, TaxCut, or TaxSaver, this year's program will ask if you want to import the relevant data. TurboTax

pioneered multimedia help, and this year's edition has extensive online help and reference material available. You can also import financial data from Intuit Quicken or QuickBooks, or Microsoft Money, which can speed up return preparation and accuracy.

As in last year's version, you have your choice of selecting forms and worksheets to fill in, or letting the software walk you through a question-and-answer interview. This interview does not make the preparation process much longer, and is a good idea for most people, since it hits all of the major points.

One feature that's brand-new this year is what Intuit calls the "Automated Tax Return" or ATR.

If you work for one of a growing number of companies using certain large payroll services, or have dealings with banks or investment brokers that are participating in the program, you will be able to electronically load W-2 and 1099 information directly into any version of TurboTax. This does several things. It speeds up a return's preparation, and it reduces input errors. Intuit estimates that 15 to 20 million W-2s and 1099s will be available for import this tax



season, with more institutions joining the program next year. This ATR capability is included in all personal 1040 TurboTax versions, except the Form 1040EZ.

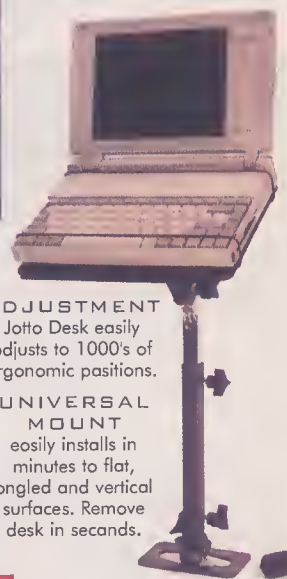
Enhanced in this year's version are Financial Management Tools. During the return-prep process, the software can suggest ways to save on next year's taxes,

such as starting an IRA if you don't have one. In addition, the software can also detail what you need to start an IRA (or perform other suggested actions), and even suggest various companies in an area that have partnered with Intuit. These companies have a financial arrangement with Intuit for the referral, so we'd suggest you try to find your own financial services company.

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Intuit has created a network of tax-prep professionals who can answer questions or offer advice if you are confused or in over your head. Intuit also has a financial arrangement with these professionals, and you'll be charged for the consultation, but having this network to fall back on might mean the difference between finishing your return or taking it to an accountant.

As a category, tax-prep software gets better every year. The other two software vendors are good competition, but TurboTax is still the one to beat. One reason is Intuit's relationships with a vast number of financial institutions. It allows Intuit to offer such features as this year's Automated Tax Return and Quick Cash refund anticipation loans, which let you get your refund money (for a fee) as soon as two days after the electronic filing. \$19 (\$5 rebate for e-filing).

Online Hits Big Time

ASP is one of the most frequently used Internet buzzwords. Application service providers offer an online service, hosting a software application that's used over the Net through a browser, rather than having the application reside on your PC's hard disk.

One of the first major consumer applications to make it big in the ASP approach was tax-return preparation. Last year, only a few vendors provided this service. This year, at least half a dozen vendors are offering online tax preparation, and that doesn't include the banks and other service firms that will subcontract online tax-prep services to offer to their customers.

Even the half-dozen figure is significant when

you consider that only three software vendors make up almost the entire market for in-house consumer tax preparation. Two of these three are also represented in the online market. TaxCut.com, the Block Financial company that offered online tax-prep services last year, will only offer advice and downloadable copies of the TaxCut package this year. H&R Block plans to introduce its own online preparation site, HRBlock.com, but no information on content or pricing was available when we inquired.

Preparing your return online provides several advantages over purchasing and installing the software on your hard disk. The software is always as up to date as it can be when you access it. In fact, much of the attraction of the ASP model is that the ASP provider maintains the software, so you have no updates to worry about.

Online tax-prep providers may give you another benefit—several vendors we surveyed plan to offer business returns online in addition to individual returns. If your business return is not overly complex, you may be able to save some money by preparing it yourself.

None of the vendors we contacted were ready to have us test their online services, although all will have launched by the time you read this. We asked what they plan to provide for this tax season, and the responses we got are detailed here.

CCH CompleteTax.com

CCH, known years ago as Commerce Clearing House, is a well-known publisher of Law and Accounting reference material. It also publishes the ProSystemfx Tax Prep software

Is Online Tax Prep Safe?

While tax prep over the Internet is poised to take off this year, many people remain concerned with privacy. As Internet use has increased over the past several years, so have instances of fraud and privacy abuse. Outside of credit card information, some of the most sensitive information available about us is the data used in compiling our tax returns. It's no surprise that many people resist signing on and keying in this personal information.

To a large extent, the safety issues regarding online Internet-based tax preparation have been well thought out and addressed by these vendors. Almost all of them have been providing tax-prep products to accountants and other tax-prep professionals for years. Client data safety and confidentiality has always been a large concern both to tax professionals and their clients, and vendors are well aware of these concerns.

For individual taxpayers, the safety issue breaks down into two separate areas—secure data transmission and vendor efforts to maintain the security of received data.

On the transmission side, your data is secured by using the SSL (secure sockets layer) features of your Internet browser. SSL was originally developed by Netscape for its browser, but has since become a standard feature in almost every browser.

SSL provides data encryption for your information before it is sent out onto the Internet. At the start of a secure transmission, your browser and the server it is talking to decide on a unique key to perform the encoding and decoding of the data stream. Once this key has been calculated and accepted, the transmission switches over to secure mode, and a symbol, such as a closed padlock, appears in your browser window. Anyone who is tapping into the data transmission does not have access to the full key, and cannot decrypt the data stream.

Once received on the vendor's side, your data is protected in a variety of ways. To a large extent, most of these are just procedures that limit access to your data to a select few, and often then only under special circumstances, such as when you call customer service with a question.

Many vendors post their privacy policies and procedures online. Others subscribe to one of the Web-auditing services, which come to the vendors' premises on a regular basis. They issue a report that the vendor is meeting prescribed standards for protecting the information.

One final security feature is actually provided by the IRS, rather than the software vendor. If you file your return electronically, whether you've prepared it online or in-house, you will receive a notice of receipt in the mail from the IRS that lets you know that the return has been received. For most filers, that's not a big deal, but it does provide a little more peace of mind.

It's in a tax-prep vendor's own best interest to do everything it can to safeguard your privacy. It's a matter of trust, and no vendor will survive in this software sector without it.

What's New in Tax Year 2000?

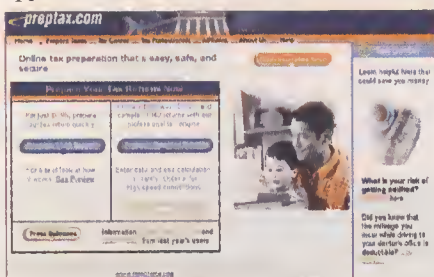
The year 2000 was quiet as far as major tax-law changes go. However, some deduction limits have been modified. We suggest you go beyond these several points and determine if a specific deduction applies to you. Deduction amounts are often tied to other factors, such as income. Check these deductions.

- Interest on a qualified higher education loan paid during the first 60 months of the loan period may be deducted up to a maximum of \$2,000 in year 2000, an increase of \$500 over 1999. In 2001, the amount will increase again, to \$2,500.
- Under an extension to 2002, employers may exclude from income as much as \$5,250 of paid qualified educational expenses incurred as tuition assistance.
- A taxpayer or a spouse covered by a workplace retirement plan can still have an IRA if adjusted gross income is below a certain limit. That limit rises in tax year 2000 to \$62,000 for a married taxpayer filing jointly, and to \$42,000 for a taxpayer filing singly or as head of household.
- The Home Office Deduction has been liberalized, so that more taxpayers can now take advantage of it.
- The Self-Employed Health Insurance Deduction rate has been raised to 60 percent.

for accountants and other professional tax preparers. CompleteTax.com offers this same quality of tax-software expertise direct to the taxpayer. For \$12.50, you can prepare federal and state individual returns and file them electronically.

TAASC PrepTax.com

TAASC is a well-known vendor of applications for accountants, businesses,



and tax preparers. This year, the vendor will offer online access to its tax-preparation software for individuals and businesses. The fee for online preparation and electronic filing of an individual federal return is \$9.95, with state returns also available online. Business returns are available, and total \$39.95 for federal and state returns.

TaxACT Online

In addition to offering its software on CD-ROM, this year 2nd Story Software is launching an online version of its TaxACT 2000 package. According to the company, the online software's operation is almost identical to the in-house version, with the same interview structure and context-sensitive help. You can print out or electronically file a return. Federal and state individual returns cost \$7.95 each, printed or electronically filed.

TAX\$IMPLE

This vendor promises to have a complete lineup of consumer tax and accounting packages on its Web site. You will be able to prepare complete individual



Federal and state returns, with multistate capability, and electronically file the federal return and any state return where the state offers e-filing.

TAX\$IMPLE has offered software to the professional Tax Preparation market for many years, and is providing online preparation of corporate (1120 and 1120S), partnership (1065), and even fiduciary (1041) returns.

TurboTax for the Web

Of all the vendors offering online tax prep at the consumer level, Intuit probably has the most experience



with its TurboTax for the Web. This year, TurboTax for the Web parallels the boxed software product, with an Automatic Tax Return feature available for online filers who have access to the requisite W-2 and 1099 information. (This feature is not available for those filing the 1040EZ form.) Lower income taxpayers, with adjusted gross incomes under \$25,000, can participate in the Quicken Tax Freedom Project, which provides free federal filing. Taxpayers who don't qualify for the free filing can file a federal return for \$14.95 before April 1, or \$19.95 after. Electronic filing is included in that price, and a state return can be filed for \$9.95. (For those filing the 1040EZ form, the filing fee is waived for the corresponding state return.)

Where To Find It

2nd Story Software
(800) 573-4287
www.toxoft.com

CCH, Inc.
www.completeox.com

H&R Block E-Solutions
(800) 457-9525
www.taxcut.com

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- > 16MB Video Memory
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > Removable 3.5" 1.44MB FDD exchangeable with opt. Iomega Zip Drive, or 2nd HDD
- > 3D Surround Sound with Hardware Wavetable
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 2 Type II or 1 Type III PCMCIA Slots
- > 56K Capable V90 Modem
- > 75.6Wh Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 1 IEEE 1394 Port & 1 Video-In Port
- > 2 USB Ports & 1 TV-Out Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Out and 1 Microphone
- > Microsoft Windows 98
- > Carrying Case and AC Adapter

2893



Common Features

- > 256KB Dn-Die L2 Cache
- > 2X AGP 8MB ATI Rage Pro 3D Video
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB Floppy Disk Drive
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 10/100 Ethernet Lan Adapter
- > 56K Capable V90 Modem
- > Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 2 USB Ports
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Out and 1 Microphone
- > Microsoft Windows ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.8" w x 10.15" d x 1.49" h

2293



Common Features

- > 128KB Dn-Die L2 Cache (Intel Celeron Processor)
- > 256KB Dn-Die L2 Cache (Intel Pentium III Processor)
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 56K Capable V90 Modem + 10/100 Ethernet
- > Infra Red, Wireless Fast IR Interface
- > 3 Hot Keys for E-Mail, Browser and API
- > 2 USB Ports
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > Microsoft Windows ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.1" w x 10.0" d x 1.48" h

5190



Common Features

- > 128KB On-Die L2 Cache (Intel Celeron Processor)
- > 256KB On-Die L2 Cache (Intel Pentium III Processor)
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Sound Effect
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 10/100 Ethernet Lan Adapter
- > 56K Capable V90 Modem
- > Infra Red, Wireless Fast IR Interface
- > 1 USB Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > A4 Size 86-Key Keyboard for Easy Typing
- > Microsoft Windows ME
- > Carrying Case and AC Adapter
- > Super Slim Notebook: 11" w x 9.4" d x 1.5" h

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Intel Pentium III Processor 866MHz
128MB 133MHz SDRAM expandable to 512MB
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64MB 100MHz SDRAM expandable to 512MB
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6.0GB Hard Drive¹
24X¹ Max. CD-R/D Drive (8X¹ Max. DVD opt.)

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15" SXGA+ Active Matrix Display
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256MB 133MHz SDRAM expandable to 512MB
20.0GB Hard Drive¹
8X¹ Max. DVD-R/D Drive

\$2395

15" XGA Active Matrix Display
Mobile Pentium III Processor 700MHz
Featuring Intel Speed Step Technology
128MB 100MHz SDRAM expandable to 512MB
20.0GB Hard Drive¹
8X¹ Max. DVD-R/D Drive

\$2145

14.1" XGA Active Matrix Display
Mobile Pentium III Processor 650MHz
Featuring Intel Speed Step Technology
128MB 100MHz SDRAM expandable to 512MB
10.0GB Hard Drive¹
8X¹ Max. DVD-R/D Drive

\$1745

12.1" XGA Active Matrix Display
Intel Pentium III Processor 650MHz
128MB SDRAM expandable to 512MB
10.0GB Hard Drive¹
8X¹ Max. DVD-R/D Drive

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- > 3.5" 1.44MB FDD
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 56K Capable¹ V90 Modem + 10/100 Ethernet
- > Infra Red, Wireless Fast IR Interface
- > 3 Hot Keys for E-Mail, Browser and API
- > 1 TV-Out Port
- > 2 USB Ports & 1 IEEE 1394 Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.1" w x 10.0" d x 1.48" h

2253



Common Features

- > 256KB Dn-Die L2 Cache
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 56K Capable¹ V90 Modem + 10/100 Ethernet
- > Infra Red, Wireless Fast IR Interface
- > 3 Hot Keys for E-Mail, Browser and API
- > 1 TV-Out Port
- > 2 USB Ports & 1 IEEE 1394 Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.1" w x 10.0" d x 1.48" h

3153



Common Features

- > 256KB Dn-Die L2 Cache
- > 2X AGP 8MB ATI Rage Pro 3D Video
- > Removable 6.0GB, 10.0GB or 20.0GB Hard Drive opt.
- > Removable 3.5" 1.44MB FDD exchangeable with opt. 2nd HDD
- > 3D Surround Sound with Hardware Wavetable
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 2 Type II or 1 Type III PCMCIA Slots which support ZV-Port and Card Bus
- > 56K Capable¹ V90 Modem
- > Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 2 USB Ports & 1 TV-Out Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Out and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.4" w x 10.1" d x 1.4" h

3153



Common Features

- > 256KB Dn-Die L2 Cache
- > 2X AGP 8MB ATI Rage Pro 3D Video
- > Removable 6.0GB, 10.0GB or 20.0GB Hard Drive opt.
- > Removable 3.5" 1.44MB FDD exchangeable with opt. 2nd HDD
- > 3D Surround Sound with Hardware Wavetable
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 2 Type II or 1 Type III PCMCIA Slots which support ZV-Port and Card Bus
- > 56K Capable¹ V90 Modem
- > Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 2 USB Ports & 1 TV-Out Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Out and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.4" w x 10.1" d x 1.4" h

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128MB 133MHz SDRAM expandable to 512MB
10.0GB Hard Drive¹
8X¹ Max. DVD-RDM Drive

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24X¹ Max. CD-RDM Drive (8X¹ Max. DVD opt.)

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High-Speed Interfaces

Plenty of changes have occurred and more are underway in the high-speed interfaces connecting the many devices that can be part of a computer system today.

by William G. Wong

Computers have used various interfaces to communicate with their attached components. Many interfaces have fallen from favor, replaced by newer, faster ones.

Speed and convenience are relative. For example, 2,400-bps serial modems were once high speed. Today, 56-Kbps modems are bottlenecks when you're connecting to the Internet. Network adapters that ran at 10 Mbps seem tame compared to the commonly available 100-Mbps Fast Ethernet devices.

High-speed interfaces can be divided into five categories based on their use—communication, storage, peripherals, multimedia, and networking.

Communication interfaces include serial and parallel connections for linking a PC to another computer. Storage interfaces are normally used with hard disks and CD-ROM drives but, like many interfaces, they are also used with other kinds of devices, like printers.

Peripheral interfaces are primarily used for devices that may be located outside the PC. They can include components like keyboards and mice but also hard disks and DVD-ROM drives.

In most cases, the storage interfaces provide better performance at a lower cost, while peripheral interfaces provide convenience at a potentially higher cost.



High-Speed Buses

BUS	PRIMARY USE	ENVIRONMENT	DEVICES	TOP SPEED	# OF PINS/CABLE TYPE
Serial	peripherals	workstation	1	230.4 Kbps	9/wire
Parallel	peripherals	workstation	1	2 Mbps	25/wire
IDE	internal drives	workstation	2	100 MB/sec	80/wire
SCSI	internal/external drives, peripherals	workstation, server	7 or 15	160 MB/sec	50 or 68/wire
Serial ATA	internal/external drives	workstation	undetermined	1.5 Gbps	4/wire
Fibre Channel	internal/external drives	server	63	2.1 Gbps	4/wire or 1/fiber
USB 1.1	peripherals	workstation	127	12 Mbps	4/wire
USB 2.0	peripherals, external drives	workstation	127	480 Mbps	4/wire
IEEE-1394	peripherals, external drives, digital video	workstation	63	400 Mbps	6/wire
MOST	multimedia	automobile	64	24.8 Mbps	1/fiber
Ethernet	networking	workstation	hundreds	10 Mbps	coax or 4/wire
Fast Ethernet	networking	workstation, server	hundreds	100 Mbps	4/wire
Gigabit Ethernet	networking	server	hundreds	1 Gbps	8/wire

We split multimedia interfaces out of the peripheral category because multimedia devices are being used independently of PCs. For example, the IEEE-1394 bus, also known as the Sony i.LINK or Apple FireWire interface, is found on high-end, digital camcorders. The interface can link the camcorder to a PC or to a VCR with a 1394 interface.

Finally, we have network interfaces. These can link one PC to another but they are also being used for storage interfaces on high-end server farms. This proves that, given a high-speed interface, almost any device can be attached to it.

High-speed interfaces use a variety of internal and external topologies that include buses, rings, and point-to-point hierarchies. The internal topology indicates how the system operates electrically. The external topology indicates how nodes (PCs and other devices connected to the network) are physically connected.

In most cases, the two topologies are the same, but they can be different. For example, a SCSI bus can be implemented in a daisy-chain configuration. The high-speed Fibre Channel interface is a loop internally, but its external connections are normally implemented as a point-to-point hierarchy.

Communication architectures normally divide into two categories. The first is a master/slave category with a single master controlling one or more slave devices. The second, the multimaster approach, allows a number of masters, although an interface arbitration scheme typically allows only one master at a time to use the interface. With the multimaster approach, any master can usually communicate with another master and any slave device on the interface.

In addition to the high-speed interfaces we present, a PC normally has one or more high-speed buses for adapters, such as the PCI or ISA bus. The maximum length of these connections is normally measured in inches, while the interfaces we discuss have limits measured in feet to miles.

Low-Speed Interfaces

With network interfaces pushing multiple gigabits per second, the lowly serial and parallel ports seem to move at a snail's pace: up to 230 Kbps for serial connections, and 2 Mbps for parallel. They are still useful, and today's implementations are faster than past versions.

Serial ports are usually used with modems, HPC synchronization cradles, and PC-to-PC links. With few exceptions these days, all modems are rated at 56 Kbps. The latter is actually asymmetric, with up to 33.6-Kbps upload and 53-Kbps download speeds, both reducible by line conditions. ISDN links push serial connections into 64- and 128-Kbps speeds.

Parallel ports were originally designed for printers, but they have been used with a variety of other peripherals, like external Zip drives and flatbed



Adaptec's 1460 PC Card SCSI adapter allows SCSI devices to be used with a notebook computer. The 1460 is designed for older laptops with 16-bit PC Card slots; a 32-bit CardBus version, the 1480, is also available.

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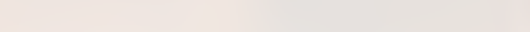
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scanners. These devices, including printers, are quickly moving away from the parallel port, leaving this interface for little more than PC-to-PC links, which are normally used to exchange files between PCs.

Serial and parallel ports are beginning to disappear from PCs, replaced by newer peripheral interfaces, like the Universal Serial Bus (USB). USB ports are standard on new desktops and on laptops sold in the last two years, and some PCs completely forego serial and parallel ports in favor of USB. The serial and parallel interfaces are now referred to as legacy ports, meaning the only reason they're included at all is that there is an installed base of (aging) peripherals that need them.

Storage Interfaces

Storage technology regularly pushes the performance envelope, and storage-device interfaces have been improving in reliability and speed. Ancient storage interfaces, like Modified Frequency Modulation (MFM) and Run Length Limited (RLL), used multiple cables. These interfaces were superseded by the still-viable integrated drive electronics (IDE) and the small computer system interface (SCSI).

IDE, also called ATA (advanced technology attachment) or ATAPI (ATA packet interface), supports two drives, designated as master and slave. No real master/slave relationship exists between the two drives, as the IDE controller is actually the bus master. IDE was designed to be a low-cost solution, and it has succeeded remarkably well in that capacity. The speed of IDE hard drives has been increasing on a regular basis. ATA/66 offers a maximum burst data-transfer rate of 66 MB/sec, while



IBM's Travelstar 32GH is an IDE hard drive with an ATA/66 interface. Although it's backward compatible with older, slower ATA standards, ATA/66 supports burst throughputs of 66 MB/sec when used with an ATA/66 controller.

ATA/100 offers a peak rate of 100 MB/sec.

IDE uses a 40-pin cable, while ATA/66 and /100 use an 80-pin cable. The connector actually has only 40 data pins, with 40 more serving as ground wires. This is a standard design technique to limit the effect of electrical noise on the interface. IDE is designed for use within a PC.

The SCSI interface uses a 50- or 68-pin cable, although some implementations, such as selected Apple computers, use 25-pin cables. SCSI uses an 8- or 16-bit bus, depending on the version, and supports seven or 15 devices, depending on the bus width.

SCSI tends to be slightly faster than IDE. The latest SCSI standard pumps data through at 160 MB/sec; this may be doubled within the year with improved specifications coming.

Speed is only part of the picture. IDE performs one action at a time. SCSI can queue up a number of actions and perform them in the most efficient manner. It can also notify the processor when actions are complete. The SCSI interface is very commonly used on file servers, while IDE rules on the desktop.

SCSI is typically implemented using a daisy-chain configuration, in which the bus loops through a device. This is easiest to see on external devices. SCSI supports longer bus lengths than IDE does. The maximum length is measured in yards, and depends upon the SCSI standard employed.

This brings up another SCSI issue: the type of transceiver used. SCSI standards can employ single-ended and differential transceivers. The type of storage device must match the type of SCSI interface and controller used. Single ended and differential devices cannot



The Shark Pocket USB Ethernet Adapter is a tiny 10BaseT device that plugs directly into a USB port. The 10BaseT Ethernet standard supports data rates of up to 10 Mbps.

be mixed. Differential supports longer bus lengths because it is less susceptible to external noise.

SCSI is used for such storage devices as fixed hard disks, removable hard disks, CD-RW drives, and DVD-RAM drives. It is also used for a limited number of peripherals, such as high-end flatbed scanners. Apple's Macintosh pushed SCSI onto the desktop, but its higher cost kept it from becoming a standard PC interface.

The higher cost of SCSI hard disks is easily justified when the drives are used in high-performance RAID systems attached to servers. Reliability is key here, and RAID systems typically support hot swapping, which had long been an exclusive feature of SCSI. Lately, IDE RAID controllers and IDE hot-swap drive bays have become readily available. IDE will not replace SCSI at the high end, but systems using IDE RAID controllers are becoming common on low-end file servers.

IDE and SCSI use wide buses to gain bandwidth, but do so at the cost of reliability as the bus lengthens. Both require expensive or limited-length cables. Serial ATA is an emerging standard that switches to a very fast serial bus instead of a wide bus. This is similar to Fibre Channel, which also uses a high-speed serial link. Serial ATA and Fibre Channel differ significantly, however.

Serial ATA is designed to replace IDE, operating in the 200 MB/sec range, providing Serial ATA with a distinct performance edge.

A point-to-point architecture is used for Serial ATA. Controllers are expected to support two to four drives, although no particular limit is set by the standard. Serial ATA also supports longer cable lengths, allowing it to support internal and external drives. It will take a while for Serial ATA to catch on, but its benefits will definitely make it popular. Expect Serial ATA drives and controllers to show up in about a year.

Fibre Channel is a high-speed serial bus that is well established, but its high cost keeps it in corporate server farms. Fibre Channel uses a loop architecture, but connections are often implemented in a hierarchical fashion, with devices being connected to a hub. This approach allows the hub to detect when a device is attached or detached. This is an important feature, since Fibre Channel is normally used in environments where hot swapping is a requirement and reliability is extremely important.

PC Peripheral Interfaces

Apple's Macintosh led the way with its ADB (Apple Desktop Bus) serial bus. This has been superseded by Apple's adoption of USB for its new Macs.

USB is also found on every new desktop and laptop PC. Devices are connected to USB hubs, which in turn connect to a USB port on a PC. The PC contains a root hub that is the master controller. USB version 1.1 is a 12-Mbps hierarchical system that supports up to 127 devices. While 12 Mbps is impressive, the truth is that many devices don't require that speed.

The speed at which a USB network operates is based on individual devices. For example, a USB mouse can be designed with a transfer rate of just 1.5 Mbps to keep costs down. This lower speed is used when the mouse sends information to the controller. A higher speed device, such as a video camera or an external disk drive, can transfer information faster.

This flexibility is useful for handling

a swarm of devices, but it does mean one or two low-speed devices can limit the overall performance of faster peripherals on the bus. It is not surprising that some high-performance motherboards actually have two independent USB controllers so human interface devices, like mice and keyboards, can be used with one controller and high-speed devices, like

cameras and disk drives, can be used with the other.

The new version of the USB standard, USB 2.0, raises the maximum speed to 480 Mbps. It is designed to be backward compatible with version 1.1. Although it has speeds comparable to the IEEE-1394 bus (which is standard number 1,394 of the Institute of Electrical and Electronics

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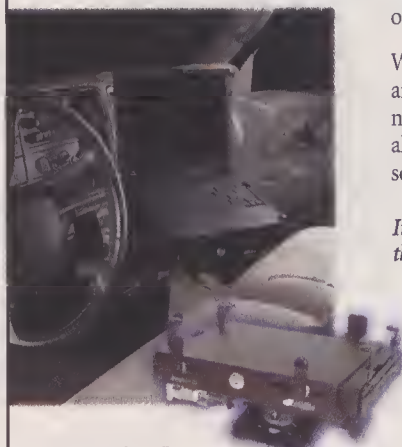
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Engineers), USB 2.0 has yet to make inroads into multimedia devices like digital camcorders. Nonetheless, USB 2.0 will be welcomed by anyone having to wait for a USB CD-RW drive that is slowed by a USB 1.1 connection.

USB can replace most PC interfaces, including parallel, serial, and PS/2. It includes hot-swap and Plug-and-Play support. This allows a PC to recognize when a device is added or deleted, and to determine the kind of device it is. A number of standard device configurations are defined, including keyboards and mice.

While USB is a great solution to the age-old problem of connecting devices to a PC when the number of those devices is small, as in the case of a standalone PC or workstation, USB PC support has its own problems of conflicting or poorly written device drivers. Trying to get a dozen USB devices to run on the same system at the same time is an exercise in installation patience. This situation has been improving as the number of available USB devices has increased and newer device drivers have been delivered.

Multimedia Interfaces

Multimedia devices like digital camcorders and VCRs are appearing with high-speed IEEE-1394 ports. This interface is similar to USB, but also differs in significant ways. The connection architecture uses a hierarchical system like USB, handling up to 63 devices at once. The slowest implementation of 1394 is 100 Mbps. It tops out at 400 Mbps. Like USB, the 1394 architecture supports devices that operate at different speeds.

IEEE-1394 differs from USB in that 1394 uses a multimaster, instead of a master/slave, architecture. This allows a camcorder to be controlled by any number of different devices—handy when copying digital movie clips from one device to another, whether it's a PC or a digital VCR.

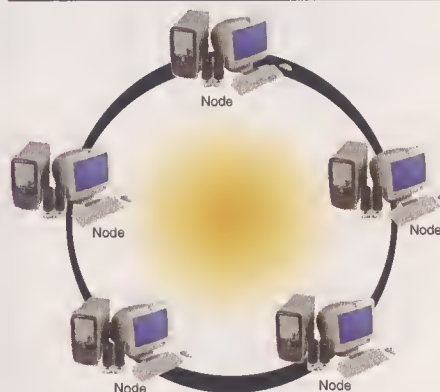
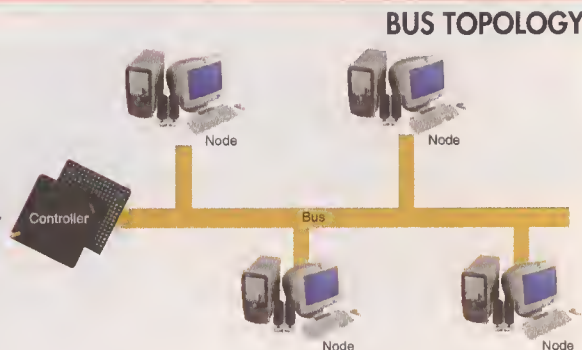
At this time, 1394 devices are fairly rare. Prices for digital camcorders with 1394 interfaces start at \$800. Very few computer manufacturers are

featuring 1394 ports in their systems, with Apple, Sony, and Compaq leading the way. PCI 1394 adapters are relatively inexpensive—under \$80—and many vendors selling 1394 devices are selling bundles that include a PCI adapter.

One place that 1394 multimedia devices may find a home is the automobile, but they will face competition, at least from built-in devices. Media Oriented System Transport (MOST) is a multimedia network originated by

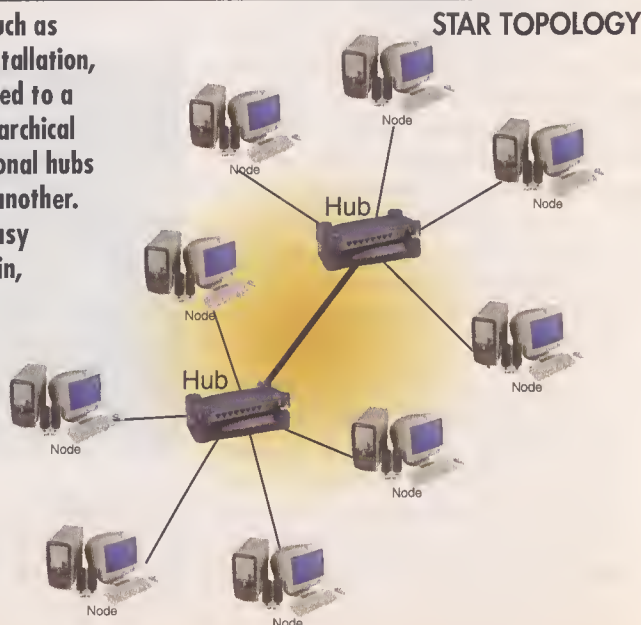
Network Connection Types

In a bus topology, all devices are connected to a central cable—the bus—which, in turn, is connected to the bus controller. A bus topology, like IDE, typically allows for inexpensive devices that are easy to set up.



In a ring topology, each node is connected by cables to two other devices to form a loop. Ring topologies generally provide very high data rates and allow for long cable lengths, but are expensive and difficult to install.

In a star topology, such as a typical Ethernet installation, all nodes are connected to a central hub. In a hierarchical star topology, additional hubs are attached to one another. Star networks are easy to install and maintain, but bottlenecks can occur because all data passes through the hubs.



Oasis SiliconSystems AG. It runs on fiber-optic cable at speeds up to 400 Mbps, putting it on a par with IDB-1394, a variation of the 1394 interface for automobile multimedia networks. IDB stands for Intelligent Transportation System Data Bus (the "T" and "S" are apparently silent). One difference between IDB-1394 and IEEE-1394 is that the connectors for IDB-1394 are more robust.

At this point, MOST is still a work in process. It is unlikely that MOST will make the jump to consumer or PC products anytime soon, but this could change in the next few years.

Network Interfaces

Ethernet has become the standard for wired networking outside the home. It comes in a variety of types, differentiated by performance. The original 10-Mbps Ethernet can operate within a hierarchical network that includes faster Ethernet types. The

100-Mbps Ethernet version is called 100BaseT or Fast Ethernet.

Currently, 10/100-Mbps products, which are compatible with current 100BaseT and older 10-Mbps 10BaseT standards, dominate workstation networking. PCI adapters sell for less than \$20, and small hubs for under \$40. Given these costs, it is not surprising that 10/100BaseT Ethernet networks are everywhere.

The original Ethernet used coaxial cable, but the latest versions use Category 5, often called Cat 5 twisted-pair wire. Fiber-optic lines are also supported. We'll ignore the coax version, since it is not used in new installations.

Ethernet uses a hierarchical network. Hubs connect Ethernet devices running at the same speed. A network can contain a mix of 10- and 100-Mbps Ethernet devices through Ethernet switches. A switch differs from a hub because a switch buffers incoming data and routes it to the intended PC. This allows a switch to receive information from multiple devices at the same time. A hub can receive information from only one source at a time.

A new standard, Gigabit Ethernet, runs at 1,000 Mbps. Even faster versions of Ethernet are in the works, but products running at these speeds are usually in corporate backbones. Gigabit Ethernet adapters and hubs are priced well above Fast Ethernet products, but since their prices are falling, Gigabit Ethernet is very likely to find its way to the desktop relatively soon.

Ethernet is a common interface to DSL and cable modems, typically

at 10BaseT. This configuration is much like using a serial modem connection. These broadband solutions remain a bottleneck between a PC and the Internet. The big difference is the size of the neck. Modems put the limit at 56 Kbps. DSL and cable modems raise the limit to more than 1 Mbps. That is still a far cry from 10 Mbps or 100 Mbps.

Other network interfaces that are popular for home and office use include 802.11b and HomePNA (Phoneline Network Association). A new interface, HomePlug, is coming soon. The 802.11b interface is a wireless network standard operating at 11 Mbps. It can be used alone or linked to an Ethernet network, as can the HomePNA and HomePlug networks. HomePNA uses telephone lines within a house to create a 1-Mbps (HPNA 1.0) or 10-Mbps (HPNA 2.0) network. HomePlug uses power lines to transmit information between network adapters. HomePlug is expected to run at 10 Mbps when it's introduced later this year. ■

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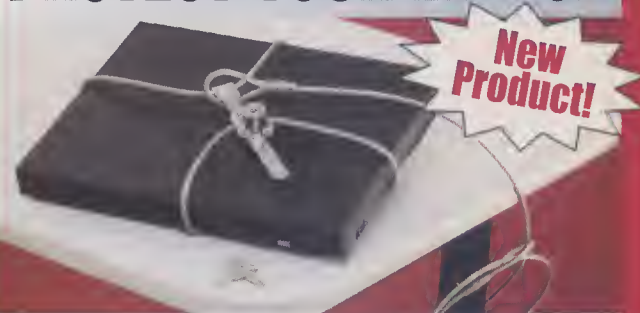
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by David Forman

You've seen the commercials. You've talked with your friends. Maybe you've even tried one of the products. It's the "Wireless Web."

Anything and everything wireless has been the rage for the last year, and the wireless Web seems to go right along with it. What is the wireless Web? How can you access it? How can you use it? We've heard a lot of hype about these products and services, but very little clear information about how they work and what they can offer us.

The wireless Web is actually many different things. Like the wired Web, it is a collection of information that is made accessible using packet-switched networks and mobile devices (known as clients) equipped with special software. However, that is where the similarities between the wired and wireless Webs end. From a user's point of view, the wireless Web functions little, if at all, like its wired counterpart.

Unlike the original wired Web, the wireless Web is not distinguished by a graphical user interface. In the early days of

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Common Features

- > 102-key Keyboard with Numeric Keypad
- > 256KB On-Die L2 Cache
- > 16MB Video Memory
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > Removable 3.5" 1.44MB FDD exchangeable with opt. Iomega Zip Drive, or 2nd HDD
- > 3D Surround Sound with Hardware Wavetable
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 2 Type II or 1 Type III PCMCIA Slots
- > 56K Capable V90 Modem
- > 75.6w Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 1 IEEE 1394 Port & 1 Video-In Port
- > 2 USB Ports & 1 TV-Out Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Out and 1 Microphone
- > Microsoft® Windows® 98
- > Carrying Case and AC Adapter

15" SXGA+ Active Matrix Display
Intel® Pentium® III Processor 866MHz
128MB 133MHz SDRAM expandable to 512MB
10.0GB Hard Drive¹
24X¹ Max. CD-ROM Drive (8X¹ Max. DVD opt.)

\$2045

2893



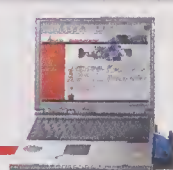
Common Features

- > 256KB On-Die L2 Cache
- > 2X AGP 8MB ATI Rage Pro 3D Video
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB Floppy Disk Drive
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 10/100 Ethernet Lan Adapter
- > 56K Capable V90 Modem
- > Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 2 USB Ports
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Out and 1 Microphone
- > Microsoft® Windows® ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.8" w x 10.15" d x 1.49" h

15" XGA Active Matrix Display
Mobile Pentium® III Processor 650MHz
Featuring Intel® SpeedStep™ Technology
128MB 100MHz SDRAM expandable to 512MB
10.0GB Hard Drive¹
24X¹ Max. CD-ROM Drive (8X¹ Max. DVD opt.)

\$1945

2293



Common Features

- > 128KB On-Die L2 Cache (Intel® Celeron™ Processor)
- > 256KB On-Die L2 Cache (Intel® Pentium® III Processor)
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 56K Capable V90 Modem + 10/100 Ethernet
- > Infra Red, Wireless Fast IR Interface
- > 3 Hot Keys for E-Mail, Browser and API
- > 2 USB Ports
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > Microsoft® Windows® ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.1" w x 10.0" d x 1.48" h

13.3" XGA Active Matrix Display
Intel® Celeron™ Processor 500MHz
64MB 100MHz SDRAM expandable to 512MB
10.0GB Hard Drive¹
24X¹ Max. CD-ROM Drive (8X¹ Max. DVD opt.)

\$1395

5190



Common Features

- > 128KB On-Die L2 Cache (Intel® Celeron™ Processor)
- > 256KB On-Die L2 Cache (Intel® Pentium® III Processor)
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Sound Effect
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 10/100 Ethernet Lan Adapter
- > 56K Capable V90 Modem
- > Infra Red, Wireless Fast IR Interface
- > 1 USB Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > A4 Size 86-Key Keyboard for Easy Typing
- > Microsoft® Windows® ME
- > Carrying Case and AC Adapter
- > Super Slim Notebook: 11" w x 9.4" d x 1.5" h

12.1" XGA Active Matrix Display
Intel® Celeron™ Processor 500MHz
64MB SDRAM expandable to 512MB
6.0GB Hard Drive¹
24X¹ Max. CD-ROM Drive (8X¹ Max. DVD opt.)

\$1295

15" SXGA+ Active Matrix Display
Intel® Pentium® III Processor 933MHz
256MB 133MHz SDRAM expandable to 512MB
20.0GB Hard Drive¹
8X¹ Max. DVD-Rom Drive

\$2395

15" XGA Active Matrix Display
Mobile Pentium® III Processor 700MHz
Featuring Intel® Speed Step™ Technology
128MB 100MHz SDRAM expandable to 512MB
20.0GB Hard Drive¹
8X¹ Max. DVD-Rom Drive

\$2145

14.1" XGA Active Matrix Display
Mobile Pentium® III Processor 650MHz
Featuring Intel® Speed Step™ Technology
128MB 100MHz SDRAM expandable to 512MB
10.0GB Hard Drive¹
8X¹ Max. DVD-Rom Drive

\$1745

12.1" XGA Active Matrix Display
Intel® Pentium® III Processor 650MHz
128MB SDRAM expandable to 512MB
10.0GB Hard Drive¹
8X¹ Max. DVD-Rom Drive

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2253



Common Features

- > 256KB On-Die L2 Cache
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 56K Capable² V90 Modem + 10/100 Ethernet
- > Infra Red, Wireless Fast IR Interface
- > 3 Hot Keys for E-Mail, Browser and API
- > 1 TV-Dut Port
- > 2 USB Ports & 1 IEEE 1394 Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.1" w x 10.0" d x 1.48" h

2253



Common Features

- > 256KB On-Die L2 Cache
- > Integrated 4X AGP Graphics with 32MB Max. user definable share Memory Architecture
- > 6.0GB, 10.0GB, or 20.0GB Hard Drive opt.
- > 3.5" 1.44MB FDD
- > 3D Surround Sound
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 1 Type II PCMCIA Slot
- > 56K Capable² V90 Modem + 10/100 Ethernet
- > Infra Red, Wireless Fast IR Interface
- > 3 Hot Keys for E-Mail, Browser and API
- > 1 TV-Dut Port
- > 2 USB Ports & 1 IEEE 1394 Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Headphone and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.1" w x 10.0" d x 1.48" h

3153



Common Features

- > 256KB On-Die L2 Cache
- > 2X AGP 8MB ATI Rage Pro 3D Video
- > Removable 6.0GB, 10.0GB or 20.0GB Hard Drive opt.
- > Removable 3.5" 1.44MB FDD exchangeable with opt. 2nd HDD
- > 3D Surround Sound with Hardware Wavetable
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 2 Type II or 1 Type III PCMCIA Slots which support ZV-Port and Card Bus
- > 56K Capable² V90 Modem
- > Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 2 USB Ports & 1 TV-Dut Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Dut and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.4" w x 10.1" d x 1.4" h

3153



Common Features

- > 256KB On-Die L2 Cache
- > 2X AGP 8MB ATI Rage Pro 3D Video
- > Removable 6.0GB, 10.0GB or 20.0GB Hard Drive opt.
- > Removable 3.5" 1.44MB FDD exchangeable with opt. 2nd HDD
- > 3D Surround Sound with Hardware Wavetable
- > 2 Built-In Stereo Speakers and 1 Built-In Microphone
- > Built-In Touchpad Pointing Device
- > 2 Type II or 1 Type III PCMCIA Slots which support ZV-Port and Card Bus
- > 56K Capable² V90 Modem
- > Smart Lithium-Ion Battery
- > Infra Red, Wireless Fast IR Interface
- > 2 USB Ports & 1 TV-Dut Port
- > Other Ports: 1S, 1P, Ext. Keyboard and Ext. CRT
- > Jacks: 1 Line-In, 1 Line-Dut and 1 Microphone
- > Microsoft[®] Windows[®] ME
- > Carrying Case and AC Adapter
- > Slim Notebook: 12.4" w x 10.1" d x 1.4" h

14.1" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 866MHz
128MB 133MHz SDRAM expandable to 512MB
10.0GB Hard Drive⁴
BX¹ Max. DVD-ROM Drive

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13.3" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 866MHz
128MB 133MHz SDRAM expandable to 512MB
10.0GB Hard Drive⁴
24X² Max. CD-ROM Drive (BX¹ Max. DVD opt.)

\$1745

14.1" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 800MHz
128MB 100MHz SDRAM expandable to 512MB
Removable 10.0GB Hard Drive⁴
24X² Max. CD-ROM Drive (BX¹ Max. DVD opt.)

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13.3" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 800MHz
64MB 100MHz SDRAM expandable to 512MB
Removable 6.0GB Hard Drive⁴
24X² Max. CD-ROM Drive (BX¹ Max. DVD opt.)

\$1495

14.1" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 933MHz
256MB 133MHz SDRAM expandable to 512MB
20.0GB Hard Drive⁴
8X¹ Max. DVD-ROM Drive

\$2195

13.3" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 866MHz
128MB 133MHz SDRAM expandable to 512MB
20.0GB Hard Drive⁴
8X¹ Max. DVD-ROM Drive

\$2045

14.1" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 800MHz
128MB 100MHz SDRAM expandable to 512MB
Removable 20.0GB Hard Drive⁴
BX¹ Max. DVD-ROM Drive

\$1795

13.3" XGA Active Matrix Display
Intel[®] Pentium[®] III Processor 800MHz
64MB 100MHz SDRAM expandable to 512MB
Removable 10.0GB Hard Drive⁴
8X¹ Max. DVD-ROM Drive

\$1645

²2X Minimum, ³10X Minimum, ⁴Download speeds limited to 53Kbps. Upload speeds are less. Actual data speeds will vary depending on line conditions. ⁵Total HD accessible capacity may vary depending on operating environment. ©2000 by ProStar Computer Inc. All rights reserved. Intel, the Intel Inside logo and Pentium are registered trademarks, SpeedStep and Celeron are trademarks of Intel Corporation. All other companies and product names are trademarks of their respective companies. Dealer price is not subject to 30 days money back guarantee program. Opened software and shipping charges are non-refundable. 30-day money back guarantee does not include return freight or shipping and handling charge. Not responsible for photo or typographical errors. Price and terms subject to change without notice.

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the wired Internet, plenty of technologies could give you access to information and programs—Telnet, Gopher, and FTP, to name only a few. When the HTML browser and server (also called Web browser and server) hit the scene, they led to an explosion in content creation. Never before had a pair of software tools made it so easy for ordinary people to publish—and for many more to access—their information. The Internet grew at an exponential rate.

This collection of content, accessible from anywhere on the Internet via a Web browser, came to be known as the World Wide Web.

However, over a brief time, the terms “Web” and “Internet” became synonymous to most people. Since the lion’s share of content creation for the Internet was crafted in HTML and was accessible via a Web browser, the “Web” grew exponentially while other Internet services—Gopher, UseNet, Telnet—grew at a more pedestrian pace.

Within a few years, most users did not know the difference between the Web and the Internet at large. As a result, today’s wireless data services available on tiny cellular phone screens are being called the wireless Web. In truth, the menu-based interfaces of such devices are more like Internet Gopher sites, which were largely text-based, menu-driven, interlinked sites.

The experience of using such an Internet-enabled phone is not the extent of the wireless Web. In this article, we’ll consider any type of wireless Internet access to be part of the wireless Web.

Note that this is a much broader view than that espoused by, say, Sprint PCS. Consistently at the cutting edge of wireless digital phone services, Sprint was quick to dub its own WAP phone service “the Wireless Web.” There is a lot more to the wireless Web than that. It is actually a broad array of hardware and software services that brings Internet content and functionality to a wireless device.

From a hardware perspective, the wireless Web includes Internet-enabled cellular phones, handheld computers, two-way pagers and e-mail devices, and more traditional laptops. From a software perspective, it includes miniature browser programs, markup languages analogous to the Web’s HTML, special protocols for wireless data transfer,

and server software for supporting wireless data services.

From a network perspective, it includes a wide array of networks ranging from data-capable cellular telephone systems to high-speed wireless data networks.



If you live in one of the metropolitan areas served by Metricom’s Ricochet network, a Ricochet modem will allow your PC to wirelessly access the Internet at data rates of up to 128 Kbps.

An Industry Overview

Many wireless technologies are in use, both hardware and software. These technologies are being packaged and marketed in different ways. For the most part, product offerings are being geared to different market sectors. Naturally, a teenage college student has very different needs than a 50-year-old executive.

In general, most products and services are marketed to consumer or corporate customers. In many cases, the actual devices and networks are the same. The software, services, and packaging are just different. This should be no surprise; it is a lot like General Motors using the same chassis for an upscale Cadillac and a mid-range Buick.

Consumer-oriented products and services tend to focus on what we’ll call “gee-whiz functionality.” They push the ability to e-mail from anywhere, in addition to accessing basic news, sports, and stock quotes.

Corporate-oriented products and services tend to focus on reliability. Although an offering with more features and less reliability might tempt some customers, a corporate customer usually wants a reliable mobile messaging device more than anything else.

There are three parts to any wireless communications solution: the client device, the transport network, and the back-end infrastructure. As we explore the many offerings currently on the market, you will see different options in all three categories combined in different ways to produce a variety of products and services.

The Wireless Phone Landscape

Let’s take a look at exactly how you can access the Internet today without wires. We’ll start with digital cellular, or PCS, mobile phones. The popularity of PCS mobile phones makes them a natural choice for mobile Internet access, too.

The most basic type of Internet connectivity using a mobile phone is called SMS, or Short Message Service. SMS is a little like alphanumeric paging



WAP phones offer the convenience of voice and data access from a single device. However, their tiny screens and awkward Web navigation make them good tools for accessing the Net in a pinch, but not on a regular basis.

GSM Overseas

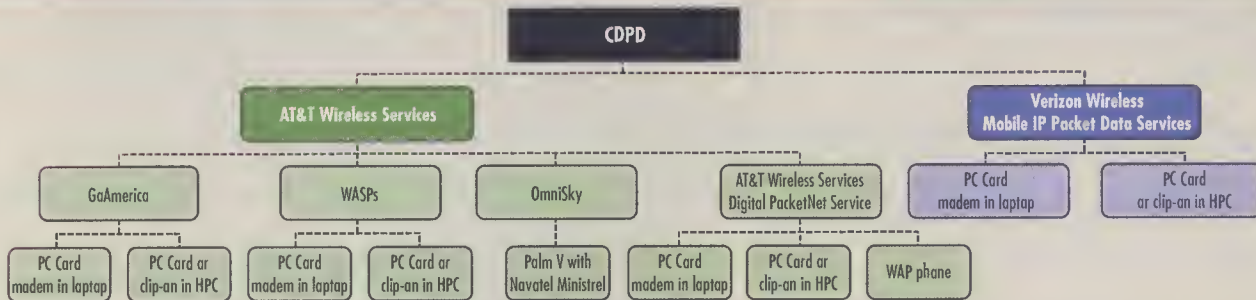
Travelers going abroad should look to a GSM phone for connectivity. You can connect it to your laptop or handheld to get online. But, make sure that it’s at least a dual-band phone. GSM works at a different frequency in the U.S. than elsewhere. In addition, Mobitex is supported in many overseas locales. □

running over a digital cellular telephone network. Most of the cellular phones in the United States can receive SMS messages. The CDMA networks operated by Verizon Wireless and Sprint PCS support SMS reception, as does the TDMA network operated by AT&T Wireless. The GSM network operated by

VoiceStream offers two-way SMS messaging.

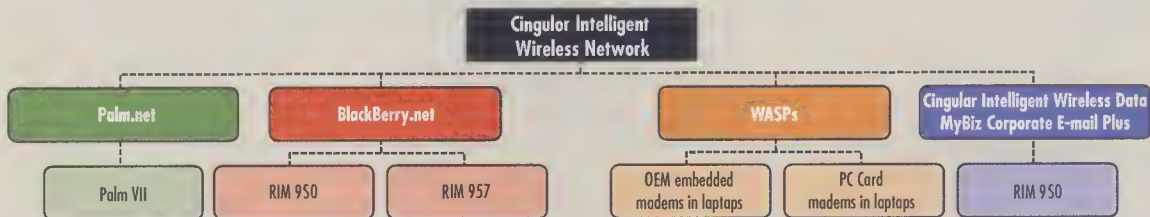
SMS is just the tip of the iceberg when it comes to Internet connectivity over mobile phones. Although SMS can easily patch through to Internet e-mail, it is limited to very short messages. It does not support any kind of information service

Wireless Services, Providers, and Devices



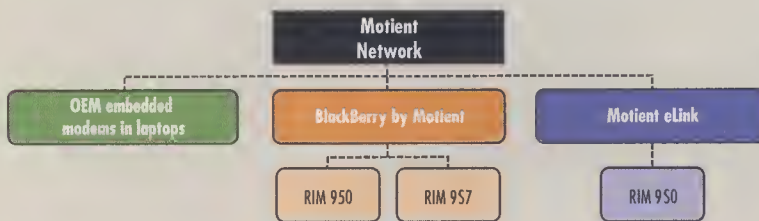
The chief CDPD providers are AT&T and Verizon. Roaming agreements between them allow a single CDPD network throughout the U.S. AT&T uses CDPD as its data network for WAP phones since its TDMA voice networks don't sup-

port data, while Verizon uses CDMA for voice. CDMA also supports data, so Verizon does not need to use CDPD for WAP phones. (Using CDPD for a WAP phone has the advantages of flat-rate pricing and packet-switched connections.)

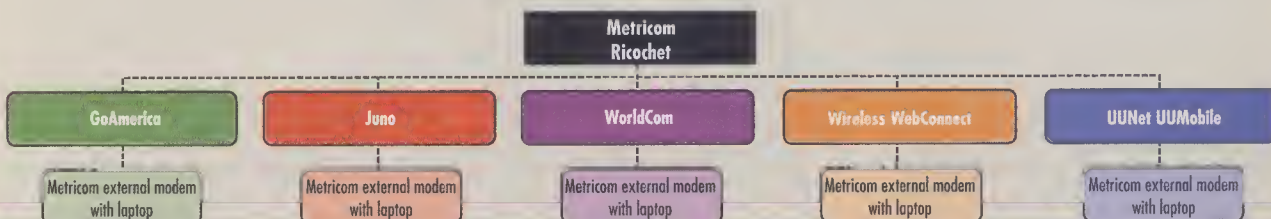


Cingular's Mobitex network is behind many different service offerings, from Cingular's own services to Palm.net and BlackBerry.net. Other Wireless Application

Service Providers, or WASPs, also sell service using third-party OEM modem solutions coupled with traditional laptops and handhelds.



Motient's service is also available via various routes, although there are fewer resellers. Motient operates as its own service provider to both corporate and industrial clients. Notice that the RIM handhelds are available even when purchasing service from other providers.



Metricom owns and runs the Ricochet networks, but you can purchase service from a number of different resellers. Better modems, including PC Card devices, are reputed to be on the way.

Wide Area Domestic Data Networks

Except where noted, all of the following are terrestrial networks.

Packet Networks (Data Only)

COMPANY	TECHNOLOGY	MAX. SPEED	FEATURES & BENEFITS
Cingular Intelligent Wireless Network	Mobitex	8 Kbps	Large domestic footprint; available internationally
Motient Network	DataToc	4.8 Kbps satellite; 19.2 Kbps terrestrial	Large domestic footprint
AT&T Wireless/Verizon Wireless	CDPD	19.2 Kbps	Large domestic footprint; Internet-like experience
Metromom	Ricochet	128 Kbps	Extremely high speed; Internet-like experience; metro areas only

Circuit-Switched Networks (Dual Voice/Data Networks)

TECHNOLOGY	PROVIDERS	FEATURES & BENEFITS
TDMA	AT&T Wireless	Does not support data; voice and SMS only
CDMA	Sprint PCS, Verizon Wireless	WAP, SMS, 14.4 Kbps circuit switched; uses air time
GSM	VoiceStream	WAP; two-way SMS; 9.6 Kbps circuit switched; uses air time; global footprint
iDEN	Nextel	9.6 Kbps circuit switched; uses air time
AMPS	AT&T Wireless	19.2 Kbps circuit switched; old-style analog; wide range; expensive; uses air time

access. For that, you must move to an Internet-enabled handheld PC or a PCS phone with WAP.

WAP, or Wireless Application Protocol, tends to get people excited; they either love it or they hate it. WAP proponents cite the fact that a single device can now support mobile voice communications and Internet access. WAP critics point out that the devices are cumbersome, the screens are tiny, and the information you can receive is limited.

The critics are right. WAP access is not like reading a Web page on your computer. Rather, it's good for getting quickie information when no other avenues are available. You can check all the standard personal information services via WAP—such as news, weather, sports, and stock prices. You can also access a lot of fun-oriented WAP sites with games, pictures, stories, and more. (Surely, the novelty element comes into play here.)

In the near future, WAP-enabled devices will be used for m-commerce, or mobile commerce. Imagine paying for an item in a store by clicking a few buttons on your mobile phone.

WAP is now available in various incarnations using a wide variety of phones from a number of the major carriers, including Sprint PCS, Verizon Wireless, and AT&T Wireless.

What, exactly, is WAP? It is a protocol for transferring

information between a server and a mobile access device. It is analogous to HTTP, or Hypertext Transfer Protocol (which is used for transferring information between a server and a Web browser.)

Just as HTTP goes along with HTML (the markup language used to create Web sites), WAP goes along with WML, or Wireless Markup Language—and, in some cases, with HDML (Handheld Device Markup Language).

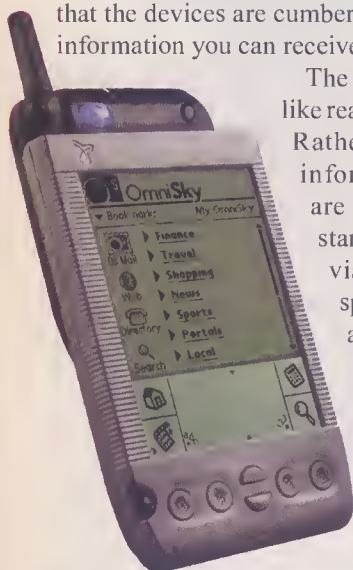
WAP services are created in the appropriate markup language and hosted on a WAP server. When you use a WAP phone to access a service, you actually download a miniature “WAP site” into your phone. It provides the menus and choices for you on the screen. You cannot access a standard HTML-based Web site via a WAP-enabled device.

From a structural point of view, a WAP site is considered a “deck.” Each screen is considered a “card.” The metaphor comes from an Apple product of the eighties known as HyperCard. HyperCard's ability to create links between pages of text is widely credited with inspiring this functionality in early Web browsers.

WAP access is available over both CDMA and GSM digital phone networks. However, AT&T's TDMA network does not support WAP. Instead, AT&T provides access to WAP sites over its CDPD (Cellular Digital Packet Data) network. Phones configured for WAP access via AT&T support TDMA for voice and CDPD for data.

The network type used affects your service. For example, since GSM and CDMA phones use the same base network technology for both voice and data, you will be billed minutes for data usage just as you will for voice. CDPD, on the other hand, is usually not metered. Therefore, a WAP phone that accesses data services over CDPD will usually offer unlimited access to the wireless Web.

The amazing thing is that, while each network type offers



OmniSky's wireless service is available for the Palm V, Handspring Visor Prism and Platinum (shown here), and HP Jornada 540, coupled with a Novatel Wireless modem. It includes software for accessing e-mail and browsing the Web.

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Bill Gates

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speed "pretty
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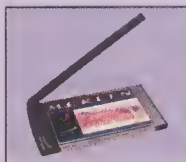
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Ricochet 128K wireless modem (fully tested, third-generation technology)

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(attaches to USB or serial port)
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Ricochet 28K modem



- \$299 for Type II
PC card modem
\$199 with upgrade
from active Ricochet
28K modem



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- \$74.95/month (Annual contract required – ask about our discount)
- Unlimited, flat-rate pricing with no roaming charges in any of Ricochet's coverage areas:
Atlanta, Baltimore, Dallas/Ft.Worth, Denver, Detroit, Houston, Manhattan, Minneapolis, Philadelphia, Phoenix,
San Diego, San Francisco Bay area (with more metropolitan areas to come in 2001)

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- Stop by for a free demo:

Call for the retail location nearest you.

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wireless Web services using a different combination of client hardware, transmission technology, and back-end infrastructure, the experience can be very similar. It's like accessing a Web page from a Mac, a Windows PC, or a UNIX system. Once you're inside the Web page in question, it's often pretty much the same experience.

Industrial-Strength Data Networks

While the mobile phone networks have garnered the lion's share of attention these days, they are not the most robust data networks in the United States. Quietly operating in the background are two other packet-switched networks that were built from the ground up to support data: Cingular Interactive's (formerly BellSouth Wireless Data) Mobitex and Motient's networks. In fact, if you include the CDPD networks operated by AT&T Wireless and Verizon Wireless, you've got three wide area data network options. Add to that the microcell network being built by Metricom, and you've got four.

What are these networks? Why have we heard so little about them?

In reality, you could easily be using Cingular's Mobitex network without even knowing it. It's the network behind the likes of Palm.net (Palm, Inc.'s wireless access service), as well as other Wireless Application Service Providers (WASPs).

The Mobitex technology was originally developed in Sweden by Swedish Telecom Radio and tested by Eriotel (jointly owned by Swedish Telecom Radio and Ericsson Radio Systems). Mobitex operates in 23 countries. Cingular's Mobitex network in the U.S. is the Cingular Intelligent Wireless Network. It runs at 8 Kbps and covers wide swaths of the country. (See www.mobitex.org for a list of overseas operators.) In the U.S., you can buy service from Cingular or from other WASPs.

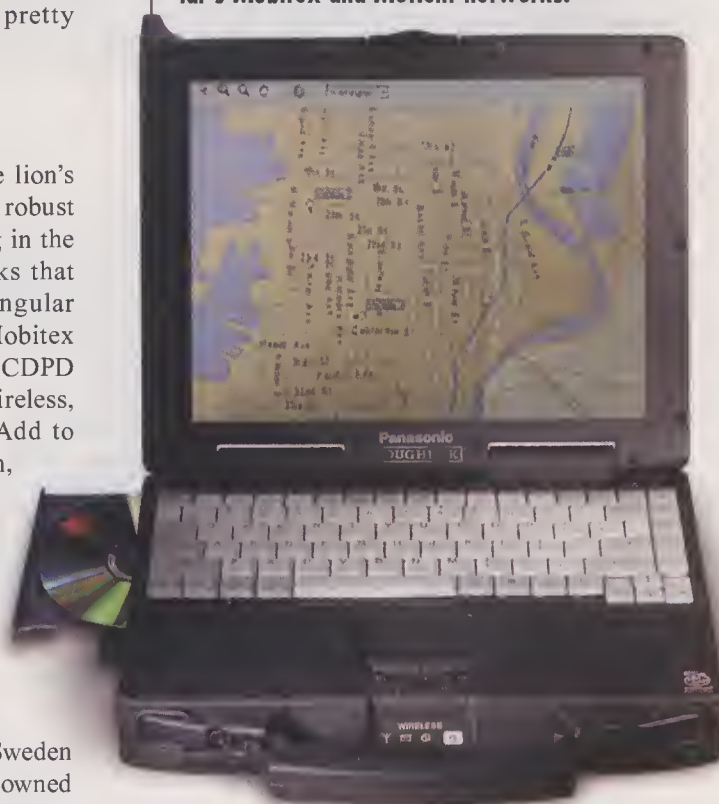
Motient's data network uses an application known as RD-LAP, or Radio Data Link Access Protocol. RD-LAP uses DataTac technology and is available over a terrestrial antenna network operating at 19.2 Kbps or over a satellite service operating at 4.8 Kbps. Motient sells its network services to businesses and consumers directly and through distribution channels.

Both Cingular's Intelligent Wireless Network and the Motient Network were designed for time-critical mobile business applications. They are engineered to guarantee message delivery, ensure the security of your data, and to get the message through no matter where you are. Both can be accessed with a wide variety of devices.

CDPD is not a dialup service; it is a wide area network connection. It operates at a maximum of 19.2 Kbps, and has a large domestic footprint. CDPD actually rides on top of the original U.S. analog cellular infrastructure, known as AMPS. It is available directly from network operators as well as through WASPs.

Metricom's Ricochet network uses a different type of

The Panasonic Toughbook CF-27 not only meets military requirements for ruggedness, it also features integrated wireless access to Cingular's Mobitex and Motient networks.



technology. In terms of raw speed, it destroys the competition, operating at 128 Kbps. Unlike the other technologies, Ricochet uses a microcell architecture, which employs poletop radios or base stations. These are typically installed on streetlights, approximately 5.5 radios per square mile. This architecture is what provides such high-speed service to mobile devices, but it makes service rollouts particularly hard, since so many antennas must be installed. Currently, it is available only in select urban areas, but is expected to be available in 46 major metropolitan areas by the end of 2001. Check the Ricochet Web site (www.ricochet.com) to see whether your location is served.

Buying Service

When shopping for a device and/or service to put you onto the wireless Web, be aware that many options are at your disposal. You can purchase hardware bundled with service or order *a la carte*. You can equip your current laptop or handheld device with wireless access, or you can purchase a second device, such as a cell phone or RIM interactive pager.

Keep in mind that in certain cases, such as WAP phones, your choice of devices will depend upon their compatibility with the service provider you want to use. Or, you may start with the device you want and seek out a compatible service provider.

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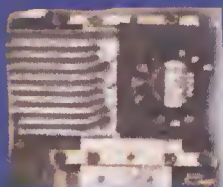
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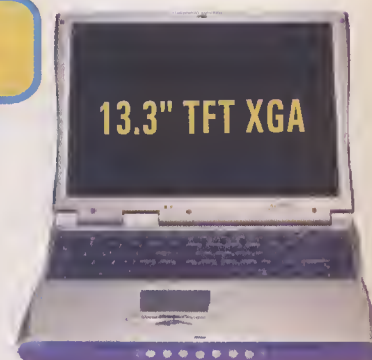
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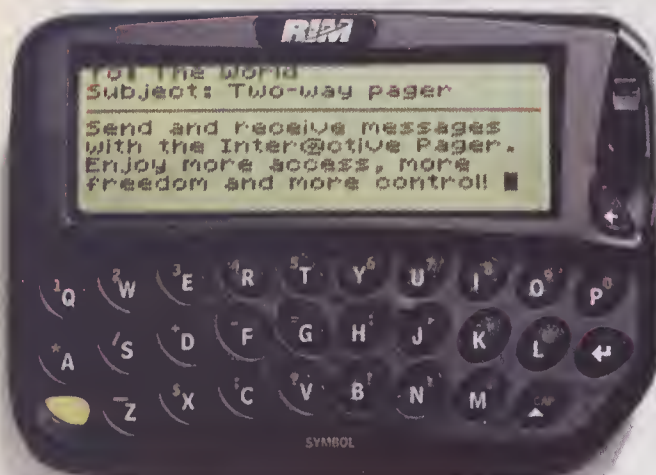
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The RIM 950 looks like an ordinary pager, but it's really a portable e-mail client that allows you to send and receive e-mail either through a BlackBerry.net account or directly through your corporate mail server.

In addition, when determining whether to equip your device or purchase a new one, it's good to know the pros and cons of each case. Proponents of single devices usually tout the convenience of easy portability. A single, lightweight device provides mobile voice and data communications. Proponents of separate devices usually point out that you'll get better functionality from those built for a specific purpose. For example, a Palm organizer is better equipped for mobile e-mail than a WAP phone, due to its bigger screen and superior input device.

Whether you're shopping for a consumer wireless solution, a soup-to-nuts corporate solution, or an *a la carte* answer, you'll have to know where to look. Let's start with the WASPs.

Understanding WASPs

Wireless Application Service Providers are ISPs that cater to the wireless market. As a provider, you don't actually have to own a network to become a WASP. At the bare minimum, you have to negotiate a deal with one of the major network providers to resell access to their network. In some cases, WASPs offer a broad range of products and services designed to cater to almost any wireless user. In other cases, they specialize in a particular hardware platform and resell network service only for their particular device.

GoAmerica has a wide array of hardware, software, and service. Through GoAmerica, you can purchase CDPD service for a laptop. You'll need a PC Card CDPD networking card from Sierra Wireless or Novatel Wireless. You can likewise purchase Ricochet service and a plug-in Ricochet modem. For handheld devices, you can purchase a Novatel Wireless Minstrel V modem for a Palm V and go online via CDPD. Or, you can purchase a RIM 950 or 957 handheld with service on the Cingular Interactive network.

Although you can purchase all of this elsewhere, the beauty of GoAmerica is that it provides one-stop shopping. It can also help you integrate a number of different devices through its Go.Web portal.

BlackBerry.net is a WASP set up by hardware manufacturer Research in Motion (RIM) for services provided by Cingular or Motient. As a result, many users refer to their RIM handhelds as "blackberries."

BlackBerry.net, through its service, provides a complete corporate solution for e-mail. It is available in two editions—one tweaked for Internet users and one for corporate users with a Microsoft Exchange e-mail server.

The RIM 950 and 957 are rugged and reliable devices that look like bulgy alphanumeric pagers. They feature small built-in keyboards and easy-to-read screens. The 950 runs on ordinary AA batteries, while the 957 offers a rechargeable Li-Ion battery. If you're looking for a business solution, RIM is a good place to start. Service is available using the Motient or Cingular Intelligent Wireless Network.

Palm.net is similar in that it was set up by a hardware manufacturer to provide wireless Internet access for its users. In this case, the hardware is the Palm VII organizer.

Palm.net provides access to e-mail and Web clippings. Though it's not the same as real-time access to Web pages, Web clippings can provide the information you need. It also runs PQAs, or Palm Query Applications, which support real-time Internet interactivity.

OmniSky is an interesting WASP—it does not specialize in a specific hardware platform like Palm.net or BlackBerry. Nor does it support any and all platforms. Instead, OmniSky seeks to support those platforms that have a wide installed user base.

The service originally packaged an OmniSky Minstrel V modem (manufactured by Novatel Wireless) for a Palm V along with nationwide CDPD service and software support from OmniSky. The service includes client software for e-mail, Web browsing, and the like. On the back end, it

For More Information

All Net Devices
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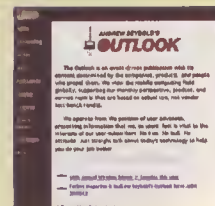
Andrew Seybold's Outlook
www.outlook.com

AnywhereYouGo.com
www.anywhereyougo.com

Cellular Telecommunications and Internet Association
www.com.com

National Telecommunications and Information Administration
www.ntia.doc.gov

Wireless Data University
www.wirelessu.com



supports compression for faster downloads.

Today, OmniSky supports a broader range of devices, including the Palm V, Handspring Visor Platinum and Prism, and the Hewlett-Packard Jornada 540 Series handheld PCs. A beta-testing program with the Compaq iPAQ PocketPC is underway.

WASPs perform an important function in the wireless sector by combining hardware technologies, network infrastructures, and custom software to create full product offerings. By going with a WASP instead of ordering products and services separately, you can avoid some setup headaches, benefit from customer software and beta tests, and even save some cash.

In many cases, you can also independently contract for service directly with network operators. In the future, expect the WASPs to continue rolling out innovative services. For example, OmniSky has announced that it is testing the Compaq iPAQ using OmniSky's wireless services over Metricom's Ricochet network. That would make it the fastest wireless handheld device in the industry.

The Right Hardware for You

For many users, hardware will dictate wireless Web decisions. The hardware you choose to carry will determine what you can do on the road. Once you have made a hardware choice, you can investigate the types of networks on which you can use the hardware.

The best way to decide which hardware is right for you is to take a serious look at what you want to do via a wireless connection. Do you need it as a full-time tool, or do you need it only for emergencies? Do you want to do everything you can do in the office, or will you sacrifice functionality to have a light, wearable device?

If you need the most complete functionality, a subnotebook or slimline notebook is for you. You can equip it with wireless connectivity and work much as you would in the office.

Using a laptop with wireless connectivity is a solid route to wireless freedom. Novatel Wireless and Sierra Wireless are the two chief vendors of wireless modems for the CDPD networks. You can equip your laptop with a PC Card unit for a few hundred dollars.

Novatel Wireless' Merlin puts CDPD connectivity directly into your laptop. It weighs only 1.6 ounces, so it won't overload your personal computing arsenal. The Sierra Wireless AirCard 300 accomplishes the same task.

Turn to AT&T Wireless or Verizon Wireless for nationwide CDPD coverage. You can also purchase service from a WASP like GoAmerica. The advantage here is that you can do virtually anything on your wireless laptop that you could do plugged into the LAN in the office. Wireless transmission will be a bit slower, but one of the big advantages is dealing with office file attachments. If you need to make on-the-road changes to a document or spreadsheet and e-mail it to a coworker, a CDPD-equipped laptop is a great tool.

Sierra Wireless has developed the AirCard 400, a PC Card adapter for Metricom's Ricochet network that allows you to wirelessly connect to the Internet with any laptop PC.



Although many users see the CDPD-equipped laptop as significantly less mobile than a handheld PC, it doesn't have to be. Almost all subnotebooks and slimline systems have a PC Card slot available and run full-featured versions of the Microsoft Windows operating system (as opposed to the more limited Windows CE, found in HPCs and Pocket PCs.)

Such systems make highly portable wireless communications devices.

Modems for Metricom's Ricochet network are also attractive options. Ricochet works much faster than CDPD. However, few are yet available that fit into a laptop's PC Card slot. Instead, most offerings are external modems that attach to the back of the display and connect through the serial port.

PC Card versions are beginning to appear. Novatel Wireless recently announced a Merlin for Ricochet PC Card (approximately \$299 through partners). Sierra Wireless' AirCard 400 for Ricochet should be available by the time you read this. Its AirCard 510, already available through Sprint, puts wireless Internet connectivity into your laptop via CDMA networks.

If you can live with less functionality, but want to be able to conveniently access e-mail, Web-based information, and your company's extranet, a wirelessly connected handheld computer is your best bet. Palm, Psion, Handspring, and Windows CE Pocket PCs can all support wireless connectivity in one form or another.

For robust e-mail, RIM pagers are probably your best bet. You won't get the kind of Web functionality available on handheld PC platforms, but you will get a workable, dependable solution for mobile e-mail. (GoAmerica, however, has worked out a way to provide Web content to all RIM handhelds.) The RIM 957 incorporates enhanced PIM functionality in the platform. It is slightly larger and more sophisticated than its 850 and 950 brethren.

Finally, if you need only basic connectivity for emergency situations, a WAP phone may be in order. People can send you messages, to which you can reply, and you can access specially formatted WAP sites. This is a very popular service in Europe. At this time, it remains unclear to what extent this platform will take hold in the U.S.

Understanding the Software

Just like the wired Web, the wireless Web runs on some pretty sophisticated software. A number of different software types are being used in client devices and back-office servers.

A good way to understand wireless software is to compare

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Network Coverage Maps

CDPD U.S. (AT&T & Roaming Partners)

www.ottws.com/general/coverage_maps/coveragegmaps.jsp?clientcode=MINICAT&mapname=notional_ip.gif

GSM U.S. (VoiceStream)

www.voicestream.com/products/coverage/locol.asp

GSM Worldwide

www.cellular-news.com/coverage/index.htm

GSM Global Roaming (VoiceStream)

www.voicestream.com/products/coverage/global.asp

Ricochet U.S. (Metricom)

www.metricom.com/about_us/coverage_maps/index.html

Mobitex U.S. (Cingular Interactive)

www.bellsouthwd.com/covopp

Motient U.S. Terrestrial (Motient Corporation)

www.motient.com/find/notional.asp

Motient Satellite (Motient Corporation)

www.motient.com/content/NetworkCoverage/SatelliteCoverage/networkmap.htm

Polm.net

www.polm.net/coverage



it to wired Internet software. There are servers, transmission protocols, and client software, such as browsers.

You can use software designed for wired systems to run over wireless systems. OmniSky's wireless Web solution can access Web pages written in HTML that initially are sent over the Internet using the HTTP protocol.

However, for wireless systems to work as well as possible, they must be configured with software designed expressly for wireless use. This software sends less information, compresses information, and finds other ways to improve the efficiency of wireless networks and their usually limited bandwidth.

For example, in the WAP world, Openwave Systems' (formerly Phone.com) UP.Browser and UP.Link Server are mainstays.

Even the language used to design information can be tweaked to work better over wireless networks. Like HTML in the wired world, there are markup languages in the wireless world: compact HTML (cHTML), wireless markup language (WML), and handheld device markup language (HDML).

Integrating with Corporate Systems

We have addressed the needs of individuals who want to get online via wireless. The needs of corporate shoppers can often be quite different. For starters, you'll have to juggle a wide array of devices. What's more, you'll have to provide secure access to your organization's private information systems.

Integrating wireless device access into your current system can be a challenge. If you are building a wireless system from the beginning, all-in-one solution providers can help. You'll benefit from standardizing on a single client device, as it will be easier to offer your users support.

If you already have wireless devices deployed in a haphazard fashion and want to create a unified infrastructure, the job may be a bit harder. One problem is that offering access by several devices is easier with a Web-based architecture. However, most mobile devices benefit from client/server connections when out of signal range. Other difficulties arise when users must juggle multiple inboxes. Security and speed are likewise primary concerns.

A number of companies have products that can help. When building your own wireless infrastructure, check out Infowave. Its Wireless Business Engine helps juggle a diverse variety of access points, client devices, and wireless applications. Intelligent compression and stripping technology speeds up wireless transmissions. Another company worth checking out is XcelleNet and its Afaria service. Even if you choose to do it yourself, you'll benefit from investigating the offerings of these two companies.

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Cingular Interactive
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GoAmerica Communications
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www.handspring.com

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Metricom, Inc.
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Motient Corp.
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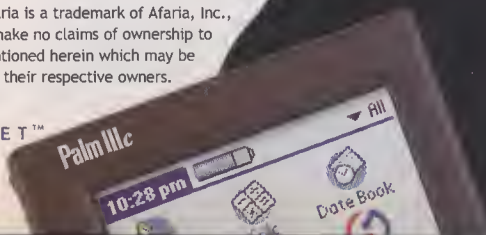
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ACCESSORIES

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To some, a laptop computer is a self-contained technological marvel. There's something to be said for that view: the technology is, indeed, marvelous. However, even the finest laptop is somehow a work in progress, a view supported by the thousands of accessories available to enhance the laptop's performance and operation.

The following mobile accessories strike us as being noteworthy in one way or another. As you might imagine, this survey merely scratches the surface of what's available. You shouldn't consider these products the final word in their areas, but good examples of what's available. A given item's absence from this selection shouldn't be inferred as a negative regarding its quality or utility.

REVIEWS

Addonics Pocket DVD2K DVD drive

DVD-ROM drives are increasingly available as factory options on new systems, but that doesn't help owners of older laptops. Should you want to watch a DVD movie or install a DVD-

based application, like *The Complete National Geographic*, an external drive will be needed.

Several such drives are available, but since this is a feature on mobile accessories, we'll concentrate on a drive that combines performance with

portability. Rated at 8X for DVD-ROM discs and 24X for CD-ROMs, the Addonics Pocket DVD2K lives up to its name, measuring a very manageable 6.4 x 5.4 x .9 inches, and weighing in at well under a pound.

The device's travel-friendliness is further enhanced by its ability to draw power from the same CardBus-enabled PC Card slot that provides the signal path. In the event that the slot doesn't provide enough power, an alternate is provided in the form of a PS/2 power cord. As a last resort—or for desktop use—the package also includes an AC adapter. \$349.

Alaris QuickVideo DC101 digital/Web camera

This shockingly inexpensive dual-mode digital camera takes 20 snapshots at a Web-friendly 352 x 288 pixels, and sends them to a host computer via either the USB or serial interface. In addition, when tethered to the computer, the Alaris QuickVideo DC101 can be used to capture video for e-mail, videoconferencing, and other Webcam applications.

Although the low resolution precludes using DC101-captured images for hard-copy enlargements, the small file size makes sending snapshots via e-mail a fairly quick process, even when using a dialup connection. The price is low enough to make the DC101 worth buying on spec alone. If the results turn out to be less than ideal, pass it on to a young niece or nephew and be a hero. \$80.



A laptop is an incredibly useful business tool, but a thoughtful selection of these helpful accessories can maximize its potential, particularly on the road.



Amacom Baby CD-RW drive

CD-RW drives have become an almost standard component for all but the most entry-level of desktop PCs. In the laptop universe, by contrast, the availability of a CD-RW drive as an option is a fairly recent development. Fortunately, the aftermarket has been quick to fill that void, and Amacom, makers of the ingenious FlipDisk hard drive, offers one that's both capable and convenient.



At 6.1 x 5.4 x .9 inches, the hot-swappable Baby CD-RW takes up very little space in the road warrior's traveling kit. For playing discs, no power supply is required the same PC Card connector that serves as a communications channel provides the required amperage. For burning CDs, the Baby CD-RW requires an AC adapter. To allow the Baby CD-RW to move between laptop and desktop systems, Amacom offers optional USB and parallel port connection kits.

The device writes and rewrites at 4X speed, and reads CD-ROM discs at 20X. It supports track-at-once, disk-at-once, multisession, packet write, and session-at-once writing modes. While not a speed demon, the Baby CD-RW compensates by being exceptionally portable. \$320.

APC SurgeArrest Notebook Pro

It can be argued that laptop computers have no need for surge protection. When a laptop is plugged in, its power supply serves that purpose, at least to some degree. When it's running on battery power, the quality of the AC line is not an issue. Yet, what about those times when the power supply *isn't* sufficient protection? What about spikes from unruly phone lines?

Even the least costly laptop represents a considerable investment, and the price of APC's SurgeArrest Notebook Pro is a small sum to pay for the combined AC/phone line protection it affords. The device's inline configuration is both convenient and compact, and a supplied mounting strap keeps all cords tidy.



A single protected AC outlet is joined by sufficient modular RJ-11 phone jacks to protect two connected devices.

The phone-protection system includes excess current-detection circuitry that triggers a visual alarm, allowing

the line to be tested before the modem is connected. A lifetime warranty sweetens this already attractive deal. \$60.

AVerMedia AVerEpack presentation system

Even the slimmest and lightest of today's slim/light notebooks can be a lot to carry, especially if its being toted across the country for the sole purpose of running a presentation. At least that's the assumption behind the AVerEpack. The AVerEpack is a truly innovative product, and its inherent cleverness is used to good effect.

With the AVerEpack, you store PowerPoint files or other images on a CompactFlash card, which is inserted into the compact (6 x 4.3 x 1.4 inches, .5-pound) main unit. Once the files have been stored, the AVerEpack can send the presentation to any TV, projector, or VGA monitor. A wireless remote provides full control over the presentation.



The package includes application software, S-Video and AV output cables, and the parallel cable that's used to transfer the presentation files from PC Card to CompactFlash card. \$299.

Brother MP-21C color ink-jet printer

In the fifties, a company could rivet a handle to the top of a 50-pound TV set and call it portable. Memories of that era cause some of us to view claims of portability with a jaundiced eye, and to examine the associated specifications with more than a little care. Having done so in the case of Brother's 720 x 720 dots-per-inch MP-21C portable printer, we can report that it would be a welcome addition to our traveling kit.

At 2.2 pounds, the MP-21C adds very little to the traveler's burden, while its 11.8 x 4.2 x 2-inch dimensions should allow the unit to find space in even the most crowded carrying case. Brother has combined the power and data interface in the



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MP-21C's PC Card connection, allowing it to be powered by the host laptop. A very efficient print engine minimizes the impact on the laptop's battery when printing must be done away from an AC outlet.

Options include an AC power adapter, a parallel port interface, and a 30-page sheet feeder. When those options are added to the package, the MP-21C becomes a viable choice for use as a light-duty desktop printer. \$270.

Compaq MP2800 portable projector

Sleek and compact, the Compaq MP2800 is the most stunning-looking projector available today. But, its looks aren't everything. This magnesium-clad powerhouse weighs just three pounds and offers all the flexibility a traveling presenter could need.

The MP2800 provides 900 lumens of brightness and a sharp XGA resolution. It supports HDTV and comes with a multimedia adapter for DVD players and VCRs. Its built-in speaker offers surprising loudness and clarity. As a bonus, the device incorporates an innovative quick-change lamp. Despite massive price reductions in recent years, a multimedia projector is still a big investment. The MP2800's price seems more than justified by its combination of features, performance, and portability. *For a full review of the MP2800, see "Eye on Technology" on page 20.* \$4,999.



Datadesk NoteBoard notebook keyboard

One of the minor stumbling blocks inherent in using an external keyboard with a notebook computer is the need to find room for both devices. Datadesk addresses that issue with the simple and elegant NoteBoard. In essence, the NoteBoard is a standard full-sized keyboard that's equipped with four flip-down legs. When deployed, those legs create a space beneath the NoteBoard for the notebook chassis. This, in turn, positions the notebook's screen for optimum readability. \$70.



DataZONE DataBook portable hard drive

The DataBook is an interface-independent portable hard disk drive that's about the size of a videocassette and weighs seven ounces. Available with interchangeable USB, IEEE-1394, and PC Card cables, the DataBook can be had with 5, 10, 20, or 30GB capacity.

Among the aspects of its design that distinguish the DataBook from other portable drives is its ability to withstand a drop from a desktop height of 30 inches. The drive comes with preloaded backup, scheduling, and password-based encryption software, facilitating its use as a backup device as well as a general storage drive.

DataZONE also offers a DataBay device bay which, when installed in a desktop system's standard half-height external drive bay, allows the DataBook to be shared between the desktop system and a laptop. There are less costly external hard drives, but none that offers the DataBook's flexibility and other virtues. \$199 (5GB), \$299 (10GB), \$499 (20GB), \$699 (30GB).



DeLorme Earthmate Road Warrior Edition

The Global Positioning System (GPS) uses a multibillion-dollar network of satellites to provide astonishingly accurate "you are here" information to anyone with a GPS receiver. In the laptop domain, the information from a GPS receiver can be used to provide much useful information, and DeLorme's Earthmate Road Warrior Edition stands out as being particularly well conceived.

The package includes the compact Earthmate receiver, along with a special edition of its Street Atlas mapping application—a remarkably comprehensive street-level atlas of the entire country, which can calculate a route between any two given points.

While you drive, the laptop provides spoken directions. Any deviation from the calculated route prompts the program to offer a way to get back on track. It can recognize voice commands, too. Anyone who travels with a laptop ought to run out and buy Earthmate Road Warrior Edition, right this minute. \$200.



Ethentica Ethenticator MS 3000

The bad guys might guess, or find a way to bypass, your laptop's password, but they're not likely to be able to fake your fingerprints. Ethentica's fingerprint-based Ethenticator MS 3000 is one of the best ways to keep unauthorized eyes from scanning your data. In use, nothing could be simpler: the MS 3000 is a PC Card that incorporates a fingerprint scanner. It interrupts the boot process, and if the right whorls aren't detected, the system won't start.



Beyond providing bootup security, the MS 3000 can be used as an alternative trigger for a variety of password-secured operations. Since many of those passwords related to Web sites might otherwise be stored as cookies, this aspect of MS 3000's operation offers not only convenience, but another level of security. *\$199.*

Kensington FlyLight

You're on the red-eye to New York, the cabin is dark, and your seatmate is fast asleep. Too jazzed by a series of successful meetings to get any sleep, you decide to consolidate your handwritten notes into a single master memo for the boss. A promotion looms large. You fire up the laptop, but realize that the overhead light will awaken your sleeping seatmate, who will then jabber away until the sun comes up. What to do?



Simple—whip out the Kensington FlyLight, plug it into your laptop's USB port, and instantly, it bathes your seatback tray—notes and all—in light. The bulb-free LED light is meant to last virtually

forever. It's located at the end of a flexible gooseneck that can be positioned wherever it's most convenient, and it draws only about 90 seconds worth of battery life from your laptop per hour. *\$20.*

Kensington SonicLock

Like an oversized combination padlock, the SonicLock attaches either to your carrying case or, using the supplied adapter, to your laptop's security slot. In either instance, it has a flashing light that indicates a state of readiness, and will shriek like a banshee if whatever it's attached to is moved.

Choose from three levels of sensitivity—the act of entering the

unlock code isn't sufficient to set off the alarm. Kensington's SonicLock is ideal for use in airports or other places where the laptop is at risk from walk-by thieves. If the blinking light alone doesn't dissuade them, the audible alarm is certain to have a discouraging effect. *\$40.*



Kryptonite Key Cable Lock

Kryptonite's reputation was established on the mean streets of New York City, where its locks kept kamikaze bicycle messengers from needing a new bike every other day. Sensibly, the company decided to apply its security know-how to the popular world of personal computers.

Kryptonite's Key Cable lock is a simple vinyl-coated six-foot cable, with a cinch loop for tethering around an immovable object, and a slot attachment that's padded to fit securely in the laptop's security slot. The 7-pin cylinder key lock is covered under Kryptonite's lifetime key registration and replacement service. The Key Cable Lock is available in 5-mm and 8-mm versions; both include a storage strap, while the thicker model also comes with a carrying case. *\$29 (5 mm); \$39 (8 mm).*



Mobility EasiDock USB 200

Mobility Electronics was among the first to deliver what so many vendors promised over the years: a true universal docking station. Although it can't pass a video signal or AC power, the USB 200 provides all of the other desktop connections, including serial, parallel, PS/2 keyboard and mouse, and five USB ports. For an additional \$50, the USB 200E adds a 10BaseT Ethernet adapter.

We've long been fans of using laptops on the



desktop, and in that connection have championed the use of docking stations. Mobility's EasiDock line makes it possible to use the same docking station with any USB-equipped notebook, regardless of make or model. \$150.

Olivision TravelScan Pro USB

Olivision's original TravelScan 600 impressed us with its combination of compact dimensions, low weight, and exceptional value. Its only real flaw was that its PC Card-based interface prevented its use with desktop systems. This limitation has been addressed with the USB-based TravelScan Pro.

At 11.1 x 1.9 x 1.5 inches, and weighing 12 ounces, the TravelScan Pro is an excellent traveling companion, but its more flexible interface greatly enhances its appeal to those who also own desktop computers. The TravelScan Pro's optical resolution of 300 dpi can be increased via software interpolation to an effective 9,600 dpi. It operates at 36 bits of color depth internally, and can output at 24-bit True Color, 8-bit grayscale, and 1-bit black and white.

The software package includes a TWAIN-compatible driver, ScanSoft PAGIS 3.0, Presto! PageManager ImageFolio, and Xerox TextBridge 8.0. \$139.



Plantronics DSP-400 USB headset

The promise of voice-recognition software seems very close to realization, and the best of today's software can, under ideal conditions, do a surprisingly good job of taking dictation and turning it into editable text. Those "ideal conditions"

call for a microphone that transmits the voice with great clarity, and rejects as much unrelated noise as possible. The microphone included with the Plantronics DSP-400 headset package incorporates noise-canceling technology in order to enhance accuracy.

To take advantage of the microphone's capabilities, Plantronics includes its PerSono Audio Control Center software, along with other speech-recognition and voice applications. When not



being used for data input, the DSP-400 serves as a fine stereo headset with digital signal processing. Incoming and outgoing audio signals are processed by the DSP-400's own circuitry; the USB connection bypasses the host system's own sound card. \$120.

Simple Technology DrivePak

Simple Technology has long offered hard disk drive upgrades for laptops, so it was a natural move for the company to package drives for external use as well. The DrivePak is available in 6GB to 30GB capacities, all of which connect to the host laptop via the USB port. If needed, power can be drawn from the laptop's keyboard port. The DrivePak is hot swappable.

A DrivePak can be used for any type of storage, but Simple Technology assumes that many users will rely on it for backups. In that connection, the company includes the Retrospect Express backup application. \$295 (6GB), \$319 (10GB), \$495 (20GB), \$849 (30GB).



Targus Optical MiniMouse

Many laptop users, when given the opportunity, choose a mouse over their onboard touchpad or pointing stick. As anyone knows who's cleaned or otherwise fussed with the ball on the bottom of a conventional mouse, not every surface is ideal for that technology.

Targus skirts that issue by equipping its compact Optical MiniMouse with an optical sensor and digital signal processing to follow and interpret mouse motion. It can be used on any hard surface except clear glass, and is equipped with a scroll wheel that can scroll up, down, left, or right, and switch between open applications. The Optical MiniMouse comes with a USB connector and includes a PS/2 adapter for older laptops. \$50.



Trek ThumbDrive

Trek's ThumbDrive takes its name from the fact that the entire device is about the size of a thumb. A solid-state storage

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that doubles as
an entertainment
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entertainment
center that
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device that has no moving parts, the ThumbDrive hot-plugs into a computer's USB port.

Once installed, the ThumbDrive appears as another drive on the system. This allows it to be used to transfer files from one system to another, or to offload sensitive documents for secure storage.

The ThumbDrive is available in several storage capacities, starting at 8MB. A 1GB version is expected by the end of 2001. It's also available as the password-protected ThumbDrive Secure, with capacities ranging from 8 to 64MB—128MB is coming soon. The ThumbDrive Secure costs \$10 more than an equivalent capacity standard ThumbDrive. *\$39 (8MB) to \$599 (256MB).*

Varatouch I-Point presentation controller



The I-Point is a remote controller that features a miniature joystick. The joystick uses patented and patent-pending control technology intended to eliminate the overshoot and inadvertent pressure-related spurious motions that have been associated with presentation joysticks in the past.

In addition to the joystick, the controller offers backlit program-

mable buttons, keyboard emulation, an 80-foot range to the receiver module, and an optional laser pointer (\$50). The device comes with Varatouch's ProShow presentation-enhancement software, which lets you zoom, draw, highlight, fade to black, take a screen capture, display a break timer, and more, using standard Windows or Mac presentation software. The I-Point can also be configured to control the computer's CD, video player, phone-answering application, and most other applications. *\$149.*

Xircom REX 6000 Micro PDA

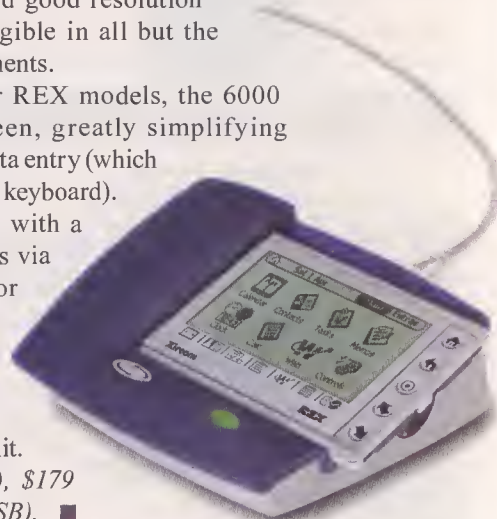
Many road warriors find it useful to carry a PDA to keep track of appointments, phone numbers, and other essential information. What sets Xircom's REX 6000 apart from other PDAs is its form factor—it's the size of a Type III PC Card. In fact, it *is* a Type III PC Card.

Besides being able to disappear into even the smallest pocket, the REX 6000 requires no additional hardware to synchronize with a laptop. The display isn't backlit, but a combination of high contrast and good resolution make it quite legible in all but the darkest environments.

Unlike earlier REX models, the 6000 has a touchscreen, greatly simplifying navigation and data entry (which is via an onscreen keyboard).

Synchronization with a desktop system is via optional serial or USB connected cradles, which add \$40 or \$50, respectively, to the price of the unit.

\$149 (PC Card), \$179 (serial), \$189 (USB). ■



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Leasing a Laptop

by David Drucker

Choosing a laptop computer is something that you can do purely on a cost/benefit basis. Computers are tangible commodities, with various, but finite, performance specifications and features. Making the right choice means defining your needs and determining which systems meet those needs. Once a list of contenders has been compiled, the ultimate choice may be made based on value-added considerations, such as warranty, service policies, and even intangibles like style.

By contrast, deciding how to pay for a laptop (or, in the case of a business, a fleet of laptops) can be a daunting task. Is it best to pay in full and be done with it, or is financing more appropriate to your circumstances? The papers are full of stories about startup businesses that were floated on the principals' credit cards.

Then there's the intriguing option of leasing. You didn't hear much about leasing before the mid-eighties, when, for a variety of reasons, it became a popular alternative for financing automobile purchases. More recently, the range of items available for lease, by both individuals and businesses, has broadened to include computers.

Is Leasing a Good Idea?

When it comes to financial advice, logic dictates that we seek it from people who have demonstrated an ability to make—and keep—money. As last year's dot-com fiascos amply demonstrated, much of the "new economy" buzz has turned out to be nothing more than hype powered by hope, and vice-versa. Given the spotty track record of today's financial experts, we'd be inclined to give their advice wide berth.

A better source of advice might be someone who acquired his fortune by actually producing something people wanted.

Such a man was J. Paul Getty. A billionaire in an era when that club had far fewer members, Getty wasn't at all reticent about sharing his methods of obtaining, keeping, and using money. Indeed, he wrote what is still considered one of the best books on the subject, *How to Be Rich*.

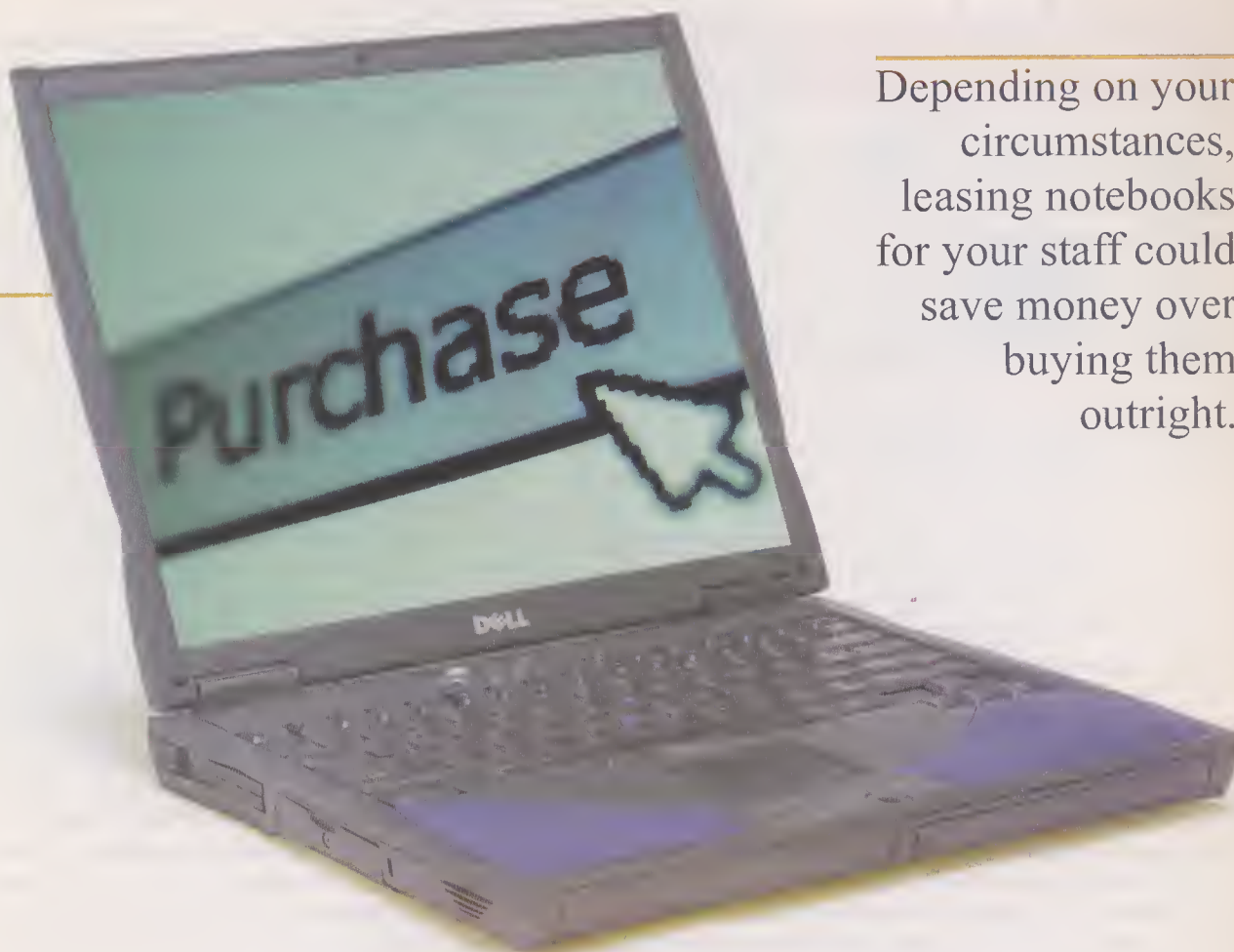
One of Getty's best-known financial pronouncements speaks directly to the subject at hand. Getty said that if something will appreciate in value, buy it. If it will depreciate in value, lease it. This would seem to make a great deal of sense, since it removes from the end user the burden of a capital investment at the front end of the transaction, and disposal of the item at the back end. However, it doesn't take into account several factors that might influence one's choice of purchasing versus leasing.

For example, in the computer domain, the actual value of the hardware to a user might have very little to do with the depreciated market value, and more to do with the nature of the tasks the computer is performing.

When we examine a more traditional and familiar lease scenario, that of a car, we can see how some of the associated assumptions can be applied to computers. Tax considerations aside, there are two obvious financial incentives to leasing a car. First, a lease either eliminates or significantly reduces the down payment (or Capital Cost Reduction, in leasing parlance).

At the core of an automotive lease is the notion that you'll be paying only for the value of the vehicle during the time it's in your possession. A large down payment *will* result in lower monthly payments, but it also negates one of leasing's primary advantages.

The second financial incentive of leasing is the lower monthly payment. In a straight purchase, the sum of the payments, including the down payment, must equal the initial purchase price of the car, as well as the interest on the transaction. With



Depending on your circumstances, leasing notebooks for your staff could save money over buying them outright.

a typical lease, by contrast, the sum of the monthly payments equals the initial purchase price, *minus* what the vehicle is expected to be worth at the end of the lease period. The lease payments, then, are based on the vehicle's depreciation: the difference between the initial purchase price and the car's anticipated value at the end of the lease.

There is a positive aspect to the higher payments inherent in a purchase transaction: when all the payments have been made, you own the car. At the end of a lease, you own nothing except, perhaps, the right to buy the vehicle at the predetermined price. If that price is lower than the actual cash value, the dealer might offer to apply the amount to a new lease.

An Auto-Industry Comparison

Consider what was, at press time, one of the better lease offers available. The vehicle in question is a 2001 Cadillac Seville STS, which carries a sticker price of \$50,750. This amount is reduced by dealer and manufacturer discounts to \$47,552.75, and a \$1,705 required down payment reduces the capitalized cost to \$45,847.75. The car's residual value at the end of the 36-month lease is slated at \$28,420. The payments are \$599 a month, and there is a \$495 acquisition fee. The total out-of-pocket cost for driving this car for 36 months is \$23,764, not including tax,

license, and registration fees.

This is a considerable sum of money, but consider the alternative. Suppose you wanted to buy that Cadillac, and were willing to make the same \$1,705 down payment required by the lease. A three-year loan at nine percent interest would mean monthly payments of \$1,458. Extending the loan to four or five years would drop the payments to \$1,141 and \$952 per month, respectively. Keeping the loan at three years and increasing the down payment to \$10,000 would reduce the monthly payment to \$1,195.

Choose the latter scenario and the three-year out-of-pocket cost is \$53,020. Assuming that the car can be sold, at that time, for the \$28,420 residual assigned by Cadillac to the lease, the cost drops to \$24,600, which is still more than what it would have cost to lease the vehicle for that duration. This, however, doesn't take into account the potential loss of income from the \$10,000 down payment, or from the \$596 delta that the loan costs as compared to the lease.

Viewing the transaction from a different vantage point, it's interesting to look at the Cadillac lease numbers and see what kind of a vehicle might be purchased for the same amount. A \$2,200 down payment and \$599 per month should be enough to buy a decent vehicle. Sticking with a nine-percent interest rate, those numbers translate into a \$21,000 purchase price. That

Caveat Emptor

This article treads some fairly complex territory, and makes some sweeping statements. Conversely, it draws some conclusions based on fairly narrow sets of circumstances. The individual who is looking for a way to acquire a computer with a minimum initial cash outlay is in a far different situation than, for example, the small-business owner who must take into consideration a host of additional factors.

One of these factors is almost certain to be the tax advantages—real and perceived—that might apply to a lease transaction. That being the case, we strongly urge anyone considering the lease of a computer “for tax purposes” to spend some quality time with an accountant qualified to deal with such matters. □

amount will buy a nicely equipped example of the most popular sedan on the American market: a Toyota Camry LE.

The LE has a base price of around \$20,400, and a little haggling should bring in a well-optioned sample at our target price. Once all of the payments have been made, each additional month it's kept (rather than sold or traded) reduces its overall cost of ownership. Each subsequent month also reduces the car's value, and increases the risk that maintenance and repairs will offset, at least to a degree, the advantage of not making loan payments.

As nice as this well-optioned Camry may be, however, there's a vast difference between a Toyota Camry and a Cadillac Seville. That difference is, in a nutshell, what makes leasing so attractive to many people. For the same price as it would take to *own* a Camry, one can *drive* a Seville. In order for this practical difference to work for a given individual, there also has to be a philosophical acceptance of the notion of non-ownership. Ultimately, then, automobile leasing works best for someone who wants a new model every few years, and to minimize the initial capital outlay.

What about Computers?

Substitute laptop for automobile in the last sentence and you would seem to have the ideal candidate for computer leasing.

In fact, computer technology moves so quickly that one might be justified in thinking that ownership makes no sense at all. A computer that was top of the line in last year's catalog is relegated to the bargain pages this year. Go back three years, and the technology is simply too dated to be considered for inclusion as a marketable product.

Therein lies the rub. For a leasing scenario to make good financial sense, there has to be sufficient residual market value at the end of the term to offset some of the capitalized cost. In the case of the Cadillac, the total payments amounted to roughly half of the original purchase price. By contrast, a computer will depreciate considerably more than 50 percent over a three-year period, and this is reflected in the leases made available by the major manufacturers.

Compaq's DirectPlus division offers two types of lease: Fair Market Value (FMV) and Finance Lease With \$1 Buyout Option. The FMV's end-of-lease options are to 1) return the equipment to Compaq and either start over with new equipment or be done with the transaction, 2) purchase the equipment at its fair market value (to be determined *at the end of the lease*), or 3) renew the lease at a lower monthly payment (based on the renewal term and the fair market value). The \$1 Buyout lease offers two options: buy the equipment for \$1, or return it to Compaq and start fresh with new equipment.

We looked at the cost of leasing a \$3,000 laptop, and came up with some interesting numbers. For a 36-month FMV lease, the monthly payment is \$101.19; the same amount with a \$1 buyout runs \$111.45, or \$369.36 more over the course of the lease. Because we don't know what figure Compaq will use as fair market value, it's impossible to know which is the better deal. We can, however, say that the \$1 buyout lease carries an interest rate of 19.97 percent; when viewed as a purchase, it can't be considered a wonderful deal. Extending the lease to 48 months reduces the already-small difference in payments between the two leases. The FMV lease runs \$84.09 a month, while the \$1 Buyout lease is \$87.60.

Glossary of Leasing Terms

Addendum: A separate document that is attached to, and becomes part of, the lease agreement.

A/R Revalver: A type of business lease financing whose collateral is the lessee's accounts receivable.

Bundled Lease: A lease that, in addition to the computer itself, covers additional products and/or services. These can include, but are not limited to, maintenance and insurance. The cost of each of these value-added items is built into the lease payment.

Capital Lease: A lease that is classified (and accounted for) as a purchase by the lessee, and as a sale (or financing) by the lessor.

In order to qualify as a capital lease, the transaction must meet at least one of the following requirements: the term is 75 percent or more of the estimated economic life of the leased item; ownership of the leased item is

transferred to the lessee at the end of the term; the present value of the lease payments is at least 90 percent of the item's fair market value (less retained related investment tax credits); the lease offers the lessor an option to purchase the item below fair market value.

Economic Life (Useful Life): The time period during which the leased item will be usable and have economic value.

End-of-Lease Option: A clause that allows the lessee to choose from among several courses of action at the end of the lease. Possibilities include purchase, lease renewal at a previously determined price, or return of the leased item to the lessor.

Fair Market Value (FMV) Purchase Option: The right to purchase the leased item at the end of the lease term at the fair market value prevailing at that time. If this option is exercised, the lessor loses the right to retain title to the item.

Full Payout Lease: A transaction whose lease payments reimburse the lessor for all costs incurred in the lease, along with an acceptable profit, without regard to the leased item's residual value at the end of the term.

Hell or High Water Clause: A carefully named provision that restates the lessee's unconditional obligation to meet the terms of the lease for its entire duration, without regard to any change in the lessee's circumstance, or to any event which affects the leased item.

Lease: A contract by which an item's owner (the lessor) grants the use and possession of that item to another party (the lessee) for a specified and predetermined period of time. The lessee, in return, agrees to make an agreed-upon periodic payment.

Lease Term: The duration of a lease agreement, plus any required or expected renewals.

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It's difficult to draw blanket conclusions from these figures, for they don't take into account other reasons for leasing's appeal to the business market. The first is that there's no up-front cash outlay, and no reliance on existing credit lines. Thus a lease is better for a business's cash flow than an outright purchase. Unlike a bank loan, leasing can often cover more than just hardware. Compaq's leasing program can encompass hardware, software, training, installation, shipping, and more. Even a consideration as seemingly mundane as the disposal of the old equipment is made easier by the type of lease that calls

for its return at the end of the term.

Not to be outdone, Dell Financial Services' (DFS) leasing program has three plans. In addition to the Fair Market Value and \$1 Buyout Option, DFS offers a ten-percent plan. At the end of the lease term, the lessee has the option of returning the system to Dell Financial Services, extending the lease for a fixed period, or buying the equipment for ten percent of the original cost.

According to Dell, under the FMV lease the payments "may be deductible as an operating expense" while on the other

Lessee: The user of the equipment being leased.

Lessor: The party to a lease agreement who has legal or tax title to the item being leased, and who grants the lessee the use of the equipment for the lease term.

Leveraged Lease: A lease in which an equity portion (usually 20 to 40 percent) of the equipment cost is borne by the lessor. The balance is provided by lenders, on a nonrecourse debt basis. Tax benefits of ownership are received by the lessor.

Mid-Lease Option: The agreed-upon right to change the leased equipment during the term of the lease. Such changes can include an equipment upgrade, subleasing the equipment to a third party, extending the term of the lease, or terminating the lease. Termination often involves paying a penalty.

Net Lease: A lease whose payments do not include

insurance and maintenance. These items are to be paid separately by the lessee.

Nonrecourse Loan: A component of a leveraged lease. The lender cannot seek repayment from the lessor, but must seek recourse from the lessee. The lessee's credit rating, therefore, is a significant factor in obtaining the lease.

Open-End Lease: A lease containing a provision that requires the lessee to guarantee the lessor a minimum value from the leased asset's sale at the end of the lease.

Operating Lease: In general, any lease that doesn't fall within the definition of a capital lease. An operating lease allows the lessee to use the leased item for a fraction of the item's useful life.

Prepayment Option: The ability of the lessee to make payments before they are due, with a view to reducing the total outlay.

Present Value: The current equivalent of payments as a series of payments to be made during the life of a lease.

Purchase Option: A clause that allows the lessee to purchase the leased item at the end of the lease term. The option may be at a specified amount or at fair market value.

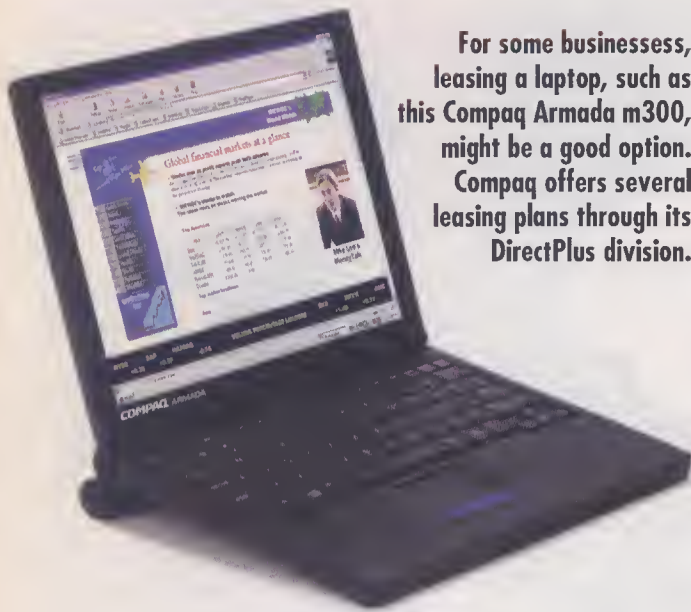
Put Option: A clause that requires the lessee (or a third party) to purchase the leased item at the end of the lease for a predetermined price.

Renewal Option: A clause that allows the lease term to be extended, at the request of the lessee, for a period of time beyond the lease's original term.

Residual Value: The leased item's value at the end of the lease term.

Sales-Type Lease: A lease by a lessor who is the item's manufacturer or dealer, and which meets the definitional criteria of a capital lease or direct financing lease. □

LEASING A LAPTOP



For some businesses, leasing a laptop, such as this Compaq Armada m300, might be a good option. Compaq offers several leasing plans through its DirectPlus division.

two plans the equipment “qualifies for standard depreciation schedule.” The tax considerations inherent in any leasing arrangement should be discussed with a tax consultant or accountant before any commitments are made.

The DFS leasing programs are for business leases only. Dell does offer consumer finance options, but not leases.

Manufacturers aren't the only source of leased computers. Many retailers, large and small, will lease computers to both businesses and individuals. The potential advantage to leasing from a retailer is a wider selection of products and services. CompUSA, for example, offers FMV, ten-percent, and \$1 Buyout leases for businesses, with terms ranging from 12 to 60 months. At the end of the term, the lease can be extended on a month-to-month basis, the equipment can be returned, or it may be purchased using the cost basis selected at the beginning of the lease.

A Couple of Real World Experiences

Bill Tabbert is an upstate New York entrepreneur who has a controlling interest in several small businesses. Each of those businesses has at least one onsite computer, and Tabbert uses one in his home office. With cash flow being a primary concern, one might expect Tabbert to be an ideal candidate for leasing. The opposite turns out to be the case, as Tabbert explains.

“I looked into leasing computers for my businesses, but decided to buy them outright. This was mostly because of the way the computers are used. For the type of light bookkeeping, correspondence, and customer tracking we do, there's no reason to have anything close to the most modern equipment, and no need for regular replacements. I started with a 486 desktop system, and it's still in place as a backup machine.

“Right now, each of my sites has one or two laptops. They range from a Pentium 166 to some Celeron 400 machines,

and I bought each one long after something faster came out. I chose laptops instead of desktops so the managers can unhook them and catch up with paperwork in the evening without having to stay late. The ones with slower machines complain a little, but the system I use in my own office is a Pentium 133, and it's plenty fast for everything I need to do for the businesses. My kids have much better systems, but they play games and shoot photos and music files back and forth over the Internet.”

Kerry Johnson, by contrast, was until recently, a principal in a medium-sized graphics design firm. “We needed to have the latest, fastest equipment available in order to keep up with our competitors, and our clients' needs. With a staff that eventually grew to 20 designers and technicians, buying new equipment every year or two would have been a huge burden. We started by leasing ten systems for two years, and then ten more a year later. That way, we always had ten new workstations on line, and no system was ever more than two years old. The monthly payments stayed the same, and were just another part of the company's nut, like rent and heat.”

The Final Word

Based on some elementary number crunching, and confirmed by the experiences of Mr. Tabbert and Ms. Johnson, we can draw a couple of conclusions. For the average individual or very small business, buying makes far more sense than leasing. Specific financial or technological factors might create an exception, as could the advice of a tax expert, but unless you have a compelling reason to lease, don't.

For bigger businesses the numbers are larger, and equipping the office with a container-load of computers can get very expensive. Leasing almost always makes sense in that context. The advantages of leasing take on an economy of scale that can be highly appealing. Businesses at this level are likely to have a tax expert on retainer, if not on staff, so our own pronouncements on the subject are, at best, moot.

To sum up, while leasing a car can make sense for a variety of reasons, under most circumstances leasing a laptop is less appealing. Our best advice is that you opt for ownership. If, after a few years, you're bitten by the “gotta get a new one” bug, passing the old one on to a colleague or relative will make you a much bigger hero than mailing it back to the manufacturer for a small credit.

Where To Find It

Compaq Computer Corp.
(888) 277-5942
www.directpluspro.compaq.com

CompUSA
(800) 766-3310
www.compusercorp.com/corp/financial/corporate_leasing.asp

Dell Computer Corp.
(800) 955-3355
www.dell.com

Dell Financial Services, L.P.
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www.dellfinancialservices.com

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LAPTOP CARRYING CASES



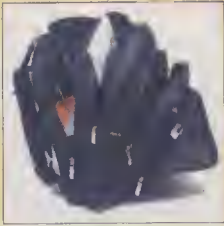
A good carrying case should offer more than a protective covering for your laptop. Choose a bag that meets your needs. Consider the bag's dimensions. Is it big enough to hold your notebook? What about materials and style? Does it fit the professional image you want to present to the world?

The right case should offer ample pockets and compartments to store peripherals, files, and whatever else you may need to carry. Serious road warriors might consider a wheeled case with extra room for a change of clothes. Others might prefer a backpack-style bag for ergonomic comfort or a portable workstation that makes working on the road less of a chore.

In the pages that follow, we've detailed carrying cases from dozens of different vendors. No matter what your individual needs, you're bound to find some suitable options here. Happy shopping!

CaseLogic KNC-3

CARRYING CASE COMPARISON CHART

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
A HAPPY MEDIUM					
The Loplonder Classique	\$109	14 x 14.5 x 7	6.5	pigskin	Cushioned leather; converts to worktable w/storage drawer; black; also tan cawhide (\$129)
BEA MAURER					
Computer Cruiser 56LB03BL	\$225	19 x 13 x 4.5	7	ballistic nylon	Ext. handle; wheels; padded computer compartment & ext. packet; mesh accessories pockets
Economy Case 50LR01BL	39	12 x 9 x 2	1	polyester	Padded case; zippered accessories pocket
Expond-A-Tate 56LB06BL	125	16 x 12 x 4.7	3	ballistic nylon	Briefcase style; expandable; removable foam laptop insert; holds printer & accessories; 2 file pockets
Large Display Computer Case 50LB14BL	55	15 x 11.5 x 2.3	1.8	ballistic nylon	Holds up to 14.1" display; padded ext. packet; int. accessories pocket
Top Loading Case 50LB42BL	95	17 x 10.5 x 4.7	2.2	ballistic nylon	Padded computer compartment & ext. packet; rigid shell; mesh accessories packet; holds laptop & printer
					 Bea Maurer Computer Cruiser 56LB03BL
BELKIN					
UrbanTrek F8E157 Stone Street Case	\$29	14 x 10 x 2.8	2.5	ballistic	Ext. file packet; accessories storage; PC Card/disk packets; laptop strap; adj. padded divider
UrbanTrek F8E365 Freeport Backpack	69	13.3 x 10.5 x 2	3.2	ballistic	Backpack style; room for books and accessories; ideal for larger laptops; PC Card/disk packets
UrbanTrek F8E366 Freeport Extended (for iBook)	79	15.3 x 10.5 x 2	3.8	ballistic	Backpack style; room for books and accessories; ideal for Apple iBook; PC Card packet; mesh disk packets
UrbanTrek F8E367 Parkway Euro Style Backpack	49	14.5 x 10 x 3.5	3.1	ballistic	Backpack style; shoulder-to-waist carrying strap; room for books and accessories; mesh disk packets
					 Belkin UrbanTrek F8E366 Freeport Extended
BRENTHAVEN					
Centerload	\$325	17.2 x 12.2 x 8.8	4.3	ballistic nylon	Award-winning removable suspension system; 4 compartments; made in USA; also in leather
Expondable Topload	325	17.2 x 12.2 x 10.8	4.4	ballistic nylon	Award-winning removable suspension system; 3 compartments; accordion file; made in USA
Glove	135	13.5 x 11.6 x 4.1	1.7	ballistic nylon	Award-winning suspension system; 2 compartments; made in USA
Slim	250	16.4 x 12.3 x 4.5	2.8	ballistic nylon	Award-winning removable suspension system; 2 compartments; made in USA; also in leather
Topload	295	17.2 x 12.2 x 7.3	4	ballistic nylon	Award-winning removable suspension system; 3 compartments; made in USA; also in leather
Urban Backpack	350	15.5 x 13.5 x 10	4.7	ballistic nylon	Award-winning removable suspension system; backpack/briefcase style; 3 compartments; made in USA
					 Brenthaven Urban Backpack
CASE LOGIC					
KNC-2	\$59	15 x 10.8 x 2	2.6	Kaskin	Legal size; organizer panel; ext. pocket for phone and papers; detachable shoulder strap; rubber feet

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- Upgrade to CompleteCare™ Service²⁰, add \$169

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- Integrated Mini-PCI V.90/56K Capable⁶ Modem
- MS® Windows® 2000 Professional
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- 3-Yr NBD On-Site Service³

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CARRYINGCASES

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
CASELOGIC (cont.)					
KNC-3	\$79	16 x 11 x 2.8	3.4	Kaskin	Padded int.; legal/letter size; adj. strap; arg. panel; exp. storage compartments; travel center w/ticket pocket; phone compartment; also in nylon
KNL-2	89	15.5 x 12.5 x 6.5	3.5	Kaskin	Top-load bag; removable padded computer sleeve; padded shoulder strap; accessories panel; zip pockets; side pockets
NC-2	49	16 x 11 x 2.8	2.3	nylon	Padded int.; letter size; adj. strap; arg. panel with slip pocket; mesh disk pockets; holds accessories
NC-3	69	15 x 10.8 x 2	3.2	nylon	Legal-size; larger capacity; arg. panel; detachable strap w/metal buckles; travel center w/ticket & phone pockets; 3 rubber feet
NCLE-2	21	13.3 x 10.5 x 2	.7	neoprene	Large shuttle; weather-resistant neoprene protection; zippered access for iBook handle or line-out port; fits larger laptop computers
NLB-1	59	16.3 x 12 x 5.3	1.6	1680-D nylon	Backpack-style; shock-resistant; adj. closure; padded straps; side pocket; front pocket; rugged zippers
NLS-1	69	14 x 12 x 3.8	2	1680-D nylon	Courier-style; shock-resistant; adj. closure; removable phone case; accessories panel; front flap pocket; rugged zippers



CoseLogic NCLE-2

CODI					
CONVERTIBLE 8808F	\$139	14.5 x 12 x 6.5	2.9	nylon/leather	Exp. front arg. pocket; rear file compartment; handle, luggage strap, & integrated shoulder straps (for backpack use)
DIPLOMAT 1006F	119	16 x 12.5 x 7.5	3.4	nylon/leather	Large org. pocket; accessories pouch; standard/legal file organizer; rear pocket; w/AirPRO system (\$159); w/COMBO option (\$169)
DUO 1100F	69	13.5 x 11.5 x 3	1.2	nylon/leather	Collapsible custom packet designed for subnotebook/traditional notebook; mid-sized org.
MOBILE PRO 9000F	199	20 x 12 x 8	9.8	nylon/leather	Up to 15" display; holds 2 notebooks or printer; wheels; 10 custom arg. pockets; w/Duo COMBO option (\$259)
PRESIDENT 2100F	129	15.5 x 12.5 x 5	3	nylon/leather	11 org. pockets; accessories pouch; standard/legal file org.; w/Duo COMBO option (\$189)
TEKPAK 7702F	119	15.5 x 13 x 5.5	2.4	ballistic/leather	Computer compartment w/removable sleeve; front organizer; slash file in front of case; accessories compartment; 3" straps



CODI TEKPAK 7702F

CURTIS					
GlobeTrotter Deluxe 26102	\$135	16 x 11.4 x 2	3.3	ballistic nylon	Top-load; holds disks/CD-ROMs; legal/standard files; accessories pouch; antislip straps; soft-grip handles; phone/ticket pocket
GlobeTrotter Slim 26100	74	16 x 11.4 x 2	2.5	ballistic nylon	Top-load; holds disks/CD-ROMs; legal/standard files; accessories pouch; soft-grip handles; antislip straps
GlobeTrotter Standard 26101	94	16 x 11.4 x 2	2.5	ballistic nylon	Top-load; holds disks/CD-ROMs; legal/standard files; accessories pouch; antislip straps; soft-grip handles; phone/ticket pocket
Roodster Deluxe 26112	120	16 x 11.4 x 2	3.3	1000-D nylon	Top-load; holds disks/CD-ROMs; accessories pouch; legal/standard files; antislip straps; phone/ticket pocket; umbrella loops; black
Roodster Slim 26110	69	16 x 11.4 x 2	2.5	1000-D nylon	Top-load; holds disks/CD-ROMs; accessories pouch; legal/standard files; antislip straps
Roodster Standard 26111	89	16 x 11.4 x 2	3	1000-D nylon	Top-load; holds disks/CD-ROMs; accessories pouch; legal/standard files; antislip straps; phone/ticket pocket; umbrella loops; black

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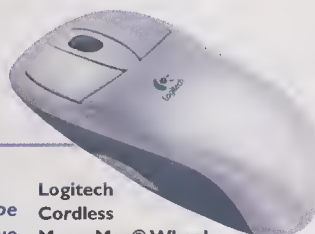
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CARRYINGCASES

DICOTA

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
BocPac2	\$59	15.8 x 15 x 7	2.4	PVC	Adj. shoulder straps; quilted padding for the back; detachable phone pocket
Boarding Cart NY	99	18 x 14 x 9	6.6	1680-D ballistic nylon	Podded notebook section; garment section; shoe bag; adj. telescopic system; inline wheels
Top Traveler II Permanent Air Cells	99	14.2 x 11.1 x 2.6	4	1680-D nylon/Koskin	Top-load; air system for protection; shoulder strap; cable pouch; available w/campment for up to 15.1" notebooks
Twenty-4 Pac	69	15.7 x 12.2 x 5.1	2.9	1680-D ballistic nylon	Backpack function through hidden straps; exp. main compartment; trolley belt; podded notebook section
Ultracase S	89	15 x 11.5 x 3.5	3	600-D polyester	Multichamber air system & aluminum frame for protection; file pouch; workstation; shoulder strap



DICOTA BocPac2

DOUBLECASE

Executive NB-4000	\$179	17 x 11.8 x 2.5	6	polyethylene	File holder; double-walled hard shell; peripherals compartment
Mobile Office NB-5060	199	17 x 11.8 x 6.5	7	polyethylene	Org.; double-walled hard shell; peripherals compartment
Traveler NB-3000	149	17 x 11.8 x 2.3	4	polyethylene	Thin profile case; double-walled hard shell



**DoubleCase
Executive NB-4000**

EASTERN COMPUTER

Eastern	\$29	12 x 6 x 2	.5	leatherette vinyl	Fits Toshiba Libretto and similar subnotebooks
Eastern	39	12.5 x 9 x 2.5	.4	leatherette vinyl	Fits slim/light notebooks; padding on all sides; holds manuals
Eastern	39	14 x 10 x 3	1	vinyl	Fits notebooks w/up to 13.1" screen; padding on all sides; ext. pockets
Eastern	39	14 x 10 x 3	1	leatherette vinyl	Fits notebooks w/up to 13.1" screen; padding on all sides; ext. pockets

FELLOWES

58422 Wheeled Computer Case	\$117	12.5 x 15.5 x 3	6.3	faux leather	Ball-bearing wheels; ext. handle; padded PDA/cell phone pocket; podded main compartment; ext. file pocket; ext. accessories pocket
58431 Computer Brief	49	11 x 15 x 2.5	2.4	ballistic nylon	Holds computer & peripherals; protective padding; ext. quick-access pockets; int. org. pocket; removable strap; cushioned handle; block
58432 Top-Zip Computer Brief	67	10.5 x 13.5 x 3	4	ballistic nylon	Top-load design; removable computer pack; 3 sections; 4 quick-access ext. pockets; int. file storage; removable strap; block
58433 Expandable Computer Case	92	10.5 x 13.5 x 3	4	ballistic nylon	Removable computer pack; exp. section; zippered file section; quick-access pocket; umbrella loops; ergonomic strap; block; leather (\$124)
58434 Classic Top-Zip Computer Case	74	12.5 x 19 x 6.5	3.8	faux leather	Removable computer pack; quick-access front pocket; main compartment; back ext. compartment; ergonomic strap; water-resistant; block
58437 Executive Computer Brief	109	12 x 16.5 x 6	3.7	faux leather	Removable computer pack; int. file compartment; ext. supplies & document pocket; ergonomic strap; block, leather (\$204)



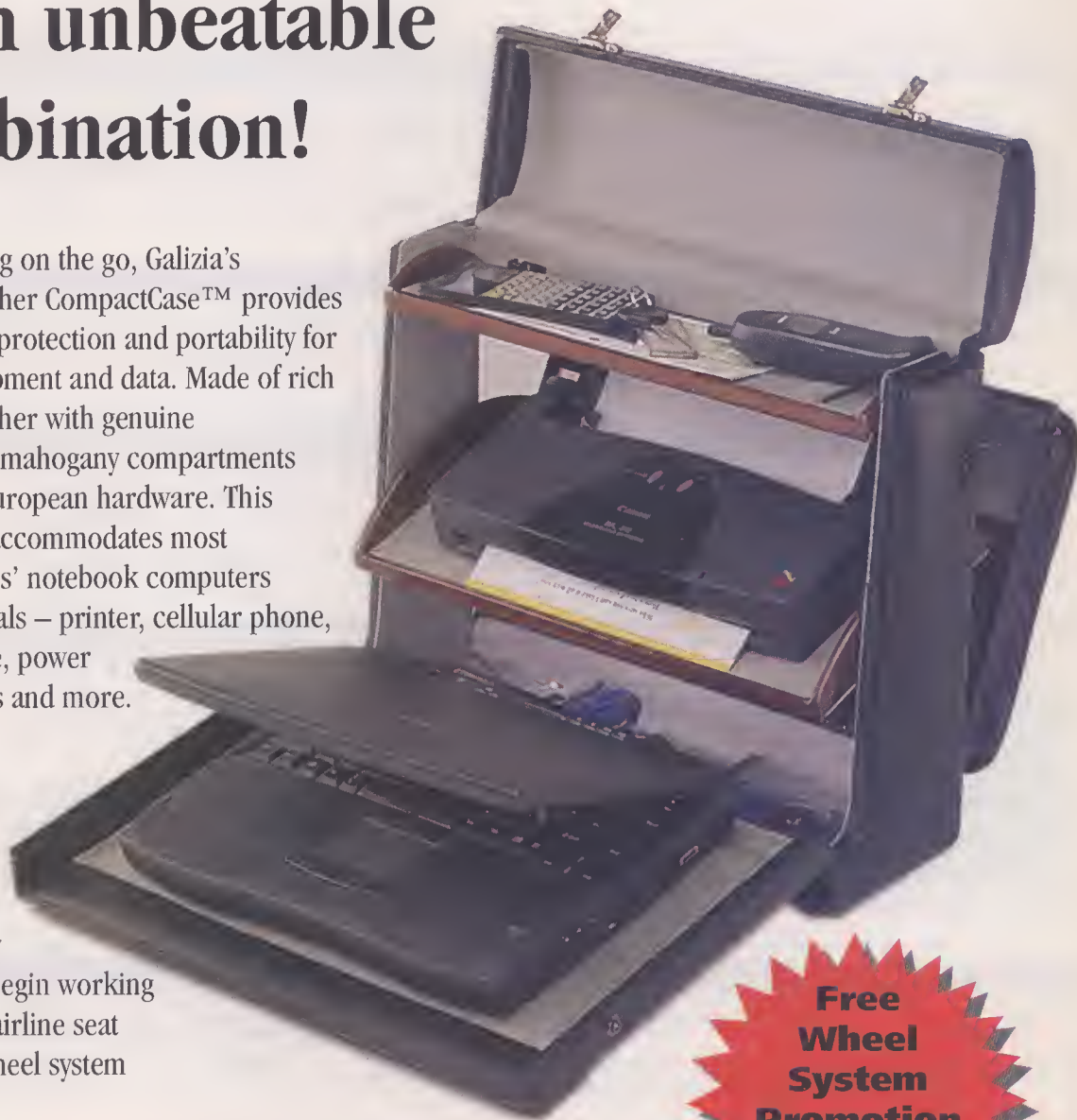
**Fellowes 58433
Expandable Computer Case**

GAUZA

AttacheCase Model 6020	\$139	17 x 12 x 6	6	leather/vinyl	Potented roll-down workcenter; flexible divider; printer compartment; file compartment; brass combo locks; fits under airline seat
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CARRYINGCASES

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
Galizia (com)					
BriefCase Model 7020	\$119	15 x 12 x 5	5.5	leather/vinyl	Patented roll-down workcenter; 3 file compartments; brass comba locks; fits under airline seat
CompactCase Model 1030	449	15.5 x 12 x 5	7	top-grain leather	Patented roll-down workcenter; holds printer; cable ready; accessories bag; file packet; brass comba locks; natural wood stain; fits under airline seat
MicraCase Model 3080	369	15 x 12 x 5	7	ballistic nylon	Patented roll-down shelves; cable ready; accessories bag; 2 side pockets; brass comba locks; fits under airline seat
PartaliaCase Model 9020	99	15 x 12 x 5	5	leather/vinyl	Patented roll-down workcenter; retractable handles; file compartment; fits under airline seat



Galizia CompactCase Model 1030

Go-Office.com

Navicase	\$129	15 x 10.5 x 3	1.5	leather	Patented features: ext. packet & strap, hang from steering wheel or luggage, hardboard lids for rigid work surface
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IC INTRACOM

IC Gear Basic Notebook Bag	\$39	15.3 x 11.3 x 2	2.2	canvas	Durable canvas; front accessories compartment; compartment for documents & notebooks
IC Gear City Bag/BackPack	59	15 x 13.3 x 4.3	3	canvas	Front compartment for accessories; compartment for documents and laptop; slim backpack design
IC Gear Designer Bag	69	14 x 11.3 x 3.3	3.3	Kaskin	Durable hard-side zipper enclosure; sleek, thin design w/detachable shoulder strap; upright standalone design
IC Gear Executive Bag	59	16.5 x 12 x 3.5	2.1	Kaskin	Durable Kaskin w/matte silver detailing; exp. compartments for accessories, documents & laptop; sleek briefcase design
IC Gear Executive Briefcase	99	18 x 12.5 x 7	4.7	Kaskin	Four compartments for documents, accessories, notebooks; expandable for the busy executive's tools; soft casing w/reinforced zippers
IC Gear Ultimate Notebook Bag	49	16 x 12 x 4	3	canvas	Durable canvas design w/exp. capabilities; separate compartments for documents and laptop; zipper-enclosed compartment



IC INTRACOM IC Gear City Bag/BackPack

iGo

Campupauch	\$19	13.5 x 10.5 x 3.5	.7	nylon	Padded compartment; zip closure; compact protection; fits up to 14" screens
iGa Anywhere Neoprene Laptop Case	24	15.9 x 11.5 x 2.5	1	neoprene	Soft, cushioned custom case; resists tearing; rugged & stylish; room for files & power supplies

Incase Designs

Laptop Brief Case	\$90	14 x 12 x 3	2.3	synthetic	Protective construction; org. panel for \$disks, cards, CDs, etc.; slash pocket for files; zip packets for pens, cables; rubberized handle, shoulder strap; graphite
Large Laptop Sleeve	50	13 x 10.5 x 2	1	synthetic	Use alone or w/larger bag; plush int. padding; utility packet; slot for files; custom shoulder strap w/solid hardware; graphite
Slimtap Laptop Sleeve	40	11 x 9 x 1	1	synthetic	Use alone or w/larger bag; plush int. padding; utility packet; slot for files; custom shoulder strap w/solid hardware; graphite



Incase Designs Laptop Brief Case

Trovel Case on Wheels

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
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INCASE DESIGNS (CONT.)

Small Laptop Sleeve	\$50	12 x 9.5 x 2	1	synthetic	Use alone or w/larger bag; plush int. padding; utility packet; slot for files; custom shoulder strap w/solid hardware; graphite
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JOURDAN

2051 Backpack	\$119	16 x 13 x 8	5	ballistic nylon	Multicompartment backpack/business case with removable CampuCarrier pouch; file packet; arg. heavily padded back and straps
2068 Computer Case on Wheels	149	17 x 13 x 8.5	9	ballistic nylon	Office on wheels; 2 gusseted packets; arg. packet; padded CampuCarrier packet; 3 exp. file compartments
2365 Two-in-one Business/ Trovel Case on Wheels	139	see "features"	9	ballistic embossed PVC	Separates with 2 quick-release buckles; business case has zip-down organizer; padded int.; movable divider & strap (16 x 12 x 2); Trovel Case (16 x 12 x 5)
8924 Computer Briefbag	265	17 x 12 x 8	5	casual cowhide	Padded; removable CampuCarrier packet; arg. panel; 3 exp. file compartments; full-length zippered packet in rear
2025 Briefbag	79	16 x 11 x 6.5	4	1680-D ballistic nylon	Gusseted front arg. pocket; padded CampuCarrier packet; 3 exp. file compartments, ext. zippered packets, adj. shoulder strap
2714 Portfolio Case	69	14.8 x 11 x 4	4	microfiber/cowhide	Interior arg. panel; nylon shoe pouch with drawstring; padded CampuCarrier packet



Jourdan 2714 Portfolio Case

KENSINGTON

Astropack	\$ 69	13 x 12 x 2	2.2	PVC coated fabric/nylon	2 compartments for laptop/files; backpack straps; accessories packets; holds iBook; gray (K62191) or black (K62192)
Compact Notebook Troveler 640708	49	13 x 10.5 x 2.5	2.3	PVC coated fabric/nylon	File packet; work from case
SaddleBag	89	13 x 12.5 x 2.5	3.7	PVC coated fabric/nylon	Briefcase/backpack-style; padded computer compartment; arg. and accessories packets; black w/black, black w/brown, or black w/graphite nubuck trim
Simply Portable Backpack 62190	102	12 x 11.5 x 2	2.8	nylon	3-way portability; executive backpack case; durable & lightweight; laptop protection
Simply Portable Three 62197	102	13 x 11.5 x 2.8	5.5	PVC coated fabric/nylon	3 compartments; 1/2" DropShield padding; .5" padded shoulder strap; EasyGrip handle; attached to wheeled luggage; arg. pockets
Simply Portable Two Plus 62189	102	13 x 10 x 2.5	4	PVC coated fabric/nylon	2 compartments; 1" DropShield padding; .8" padded adj. shoulder strap; EasyGrip handle; attaches to wheeled luggage; arg. packets; also in leather (\$149)
Sky Runner 62071A	114	15 x 9 x 2.5	2.4	nylon/PVC	3 exp. top-loading compartments; 2 outer packets; arg. panel; adj. divider; foam padding; black fabric shell; also in leather (\$149)



Kensington Sky Runner 62071A

LODIS

505NX Madison Ave Zip Tote	\$235	15 x 11 x 6	5	leather/nylon	Lots of packets; phone or glasses packet; padded computer compartment; wide strap
603BP Lodis Bug	165	16 x 12 x 8	9	polyester	Compact office; key lock; deep packets; side-door zip entry; ext. handle; inline skate wheels
606NX Exec-on-the-go Computer Brief	295	16 x 13 x 6	7.5	leather	Briefcase-style; functions as portable office; large pockets and compartments; ext. handle; inline skate wheels
609NX Exec-on-the-go Soft Side	295	16 x 13 x 5	8	leather	Soft sided; unconstructed; single entry; zippered compartment; lots of pockets; ext. handle; inline skate wheels

CARRYINGCASES

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
LODIS (CONT.)					
612NX Exec-on-the-go Junior Exec.	\$295	14 x 13 x 6	7	leather	Roomy pockets secured w/flop and key lock; accessories pockets; ext. handle; inline skate wheels
615NX Raller Computer Pack	275	16 x 13 x 7	6	leather/nylon	Wheeled or backpack style; lots of pockets for CDs, phone, peripherals; ext. handle; inline skate wheels
643XB Tuxedo Computer Tote	185	15 x 11 x 6	5	leather/nylon	Lots of pockets; phone pocket; padded computer compartment; detachable shoulder strap



Lodis 612NX Exec-on-the-go Junior Exec.

MICRO CASE-ISIS					
Backpack MC1400	\$69	12 x 10 x 2.5	3.2	1680-D nylon/Koskin	Perfect for students or hands-free travel; room for books, accessories, file folders; org. panel; hideaway straps
Diplomat MC1604	99	13.3 x 11 x 2	3.7	leather	Top-load design for 15" screens; 3 compartments for files, accessories, etc.; zip-down front panel w/organizer
Leather Traveler MC1410	99	15 x 12 x 3	5.8	leather	4 compartments; file folders; org. panel; up to 15.4" screens; clamshell design; loaded w/safety features
Navigatar I MC1601/1603	49	15.8 x 11 x 2.2	2.6	600-D polyester	Top-load design for 15" screens; front org. panel; gusseted pockets for peripherals; Navigatar II has extra compartment for clothes
Road Runner MC1602	49	13.2 x 11 x 2.2	2.5	600-D polyester	Top-load design for 15" screens; front org. panel; gusseted pockets for peripherals; compact and sporty
SlipMaster MC781	24	13 x 10.5 x 2	1.3	Koskin	Fits in briefcase or duffel; ext. accessories pockets; side zippers open to work from case

NAUGAHYDE					
NaugoCase Laptop Computer Case	\$79	14.5 x 13 x 4	2.5	Naugahyde	2 file pockets; black, burgundy, blue
NaugaCase Laptop Portable Office	89	14.5 x 13 x 6	3	Naugahyde	2 file pockets; printer compartment; black, burgundy, blue

NUTSHELL					
037	\$145	14 x 10.8 x 1.8	N/A	leather	Fits HP DminiBook 4150, XE2, NEC Verso SX, Verso LX, Toshiba Tecra 8DDD

OGIO					
Jock Pack	\$76	18 x 15 x 6.5	2.8	Kodra/ripstop nylon	"Get A Grip" protection; adhesive straps & side-release buckles; 3 oversized pockets, disk storage

PACIFIC DESIGN					
Collegiate Style Backpack, 1806	\$49	18 x 13 x 9	3	nylon	Padded computer section; large storage area; dedicated storage for PDA & cell phone; durable construction; ergonomic shoulder straps
Computer Brief Plus, 1432L	99	16 x 12 x 2.8	5.6	leather	Briefcase style for corporate users; includes rolling cart, strap; quality construction; black
Computer Brief Plus, 1432P	59	16 x 12 x 2.8	4.9	polyester	Briefcase style; holds peripherals and accessories; large file compartment; quality construction; black



Pacific Design Collegiate Style Backpack, 1806

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A NOTEBOOK COMPUTER WITHOUT TARGUS DEFCON™ SECURITY COULD BE GONE BEFORE YOU KNOW IT.



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PA400U

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DEFCON CL
PA410U



Attaches notebook to any secure object!

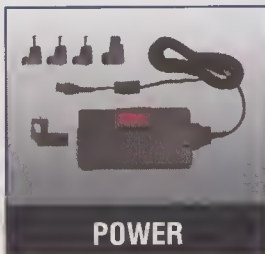
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A TRADITION OF EXCELLENCE

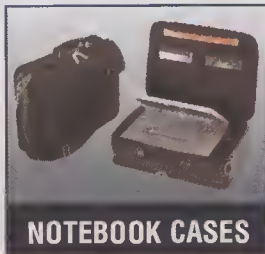
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COMMUNICATION



POWER



NOTEBOOK CASES



SECURITY



CONNECTIVITY

CARRYING CASES

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
PACIFIC DESIGN (CONT.)					
Executive Briefcase, 1538P	\$79	16 x 12 x 2.8	4.9	polyester	Briefcase style; sophisticated look; chrome hardware; holds peripherals & accessories; quality construction; black
Executive Satchel, 1539B	99	16 x 12 x 2.8	5.4	polyester	Contemporary look; accessories storage; large file compartment; quality construction; black
Executive Satchel, 1539K	99	16 x 12 x 2.8	5.8	polyester/leather	Contemporary look; accessories storage; large file compartment; quality construction; olive/tan

PELICAN

Model #1400	\$ 90	12 x 9.1 x 5.1	5.5	copolymer	Watertight, airtight, unbreakable; opt. prescored pick 'n' pluck foam & custom dividers; lifetime guarantee
Model #1450	116	14.9 x 10.5 x 6.1	8	copolymer	Watertight, airtight, unbreakable; opt. prescored pick 'n' pluck foam & custom dividers; lifetime guarantee
Model #1470AC	167	15.5 x 10.6 x 4	6.7	copolymer	Watertight, airtight, unbreakable; w/lid organizer; lined bottom; shoulder strap; lifetime guarantee
Model #1490CC	229	17.9 x 11.8 x 6.3	8.7	copolymer	Watertight, airtight, unbreakable; w/lid organizer; fitted shock-absorbing tray; shoulder strap; lifetime guarantee
Model #1500	136	17 x 11.5 x 6.3	8.7	copolymer	Watertight, airtight, unbreakable; opt. prescored pick 'n' pluck foam & custom dividers; lifetime guarantee
Model #1520	150	18 x 12.9 x 6.8	10.8	copolymer	Watertight, airtight, unbreakable; opt. prescored pick 'n' pluck foam & custom dividers; lifetime guarantee



Pelican Model #1470AC

PORT

Easy Roller PR70340	\$149	16.5 x 13.5 x 8.5	8.4	nylon	Front file compartment; accessories pockets; rear compartment for drive modules; front pocket; 36" ext. handle; air cushion
PR13440 Computer BackPack	79	17 x 14.5 x 9	3.1	nylon	Air cushion
PR99841 EasyRoller	149	15.5 x 14 x 9	11.6	nylon	Air cushion
Road Warrior PR70240	129	16.5 x 13.5 x 6.5	5.2	nylon	Front file compartment; accessories pockets; rear compartment for drive modules; front pocket; shoulder strap; air cushion
The Commuter PR70140	99	16.5 x 14 x 6	4.8	nylon	Front file compartment; accessories pockets; rear compartment for drive modules; front pocket; shoulder strap; air cushion
The Slim Case PR70040	79	16.4 x 13.5 x 3.5	3.7	nylon	Front zip compartment w/cell phone pocket; ticket sleeve; key holder; shoulder strap; rubber feet; air cushion; ergonomic handle



PORT The Slim Case PR70040

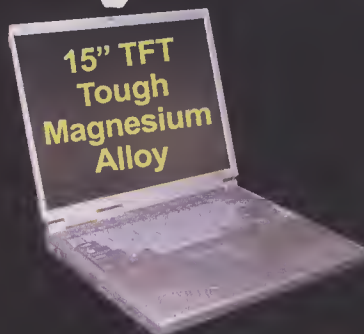
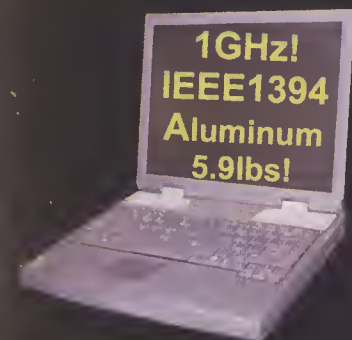
PORTER CASE

1502 AVCS	\$389	21.5 x 13.3 x 7	13	ABS	Cart; padded "multiform" interior adjusts to fit many LCD projectors; 4" ball-bearing wheels
1502 FMCS	339	21.5 x 13.3 x 7	12	ABS	Cart; 5 layers of gray foam convoluted in lid; no cloth liner; 4" ball-bearing wheels
1504 AVcase	389	17.5 x 12 x 7	12	ABS/aluminum	Cart; fully padded (holds small LCD projector and/or notebook computer); 4" wheels; 42" ext. handle; combo lock; carry-on

1GHz! 5.9lbs! Aluminum

15" 850MHz Magnesium

1400x1050 SXGA+ 1GHz



Cheetah 3v Pro

- Sleek All-in-one Design only 1.4" Thin
- Bright 13.3" Active TFT Display
- 700MHz Intel Celeron CPU
- 64MB SDRAM, up to 512MB
- 5GB UDMA HD up to 20GB UDMA 66
- Internal 24X CD-ROM, Opt. Ethernet RJ45
- Smart Li-Ion Battery, Opt. IEEE 1394
- Internal 56K Fax/Modem V.90 RJ11
- MS Win 98/ME, 3 year warranty (1yr parts)
- 12" X 9.5" X 1.4", 5.9lbs., Mini-PCI

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Cheetah 3v Exec

- same as above with the following
- 933MHz Intel PIII, 133MHz bus
 - 10GB UDMA Hard drive
 - 128MB SDRAM

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Cheetah 3v Elite

- same as above with the following
- 1GHz Intel PIII, 133MHz bus
 - 20GB UDMA 66 Hard drive
 - 128MB SDRAM
 - DVD 8X/40X CDROM included

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Panther 3m Pro

- Tough Magnesium Alloy Case
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- 5GB UDMA HD up to 32GB UDMA
- Internal 24X CD-ROM, 10/100 Ethernet RJ45
- Smart Li-Ion Battery, Security lock-out feature
- Internal 56K Fax/Modem V.90 RJ11
- MS Win 98/ME, 3 year warranty (1yr parts)
- 12.6" X 10.7" X 1.5", 6.8lbs.

Only \$2099 8X DVD add \$149

Panther 3m Exec

- same as above with the following
- 800MHz Intel PIII CPU upgradable
 - 10GB UDMA Hard drive
 - 128MB SDRAM, TV-out

Only \$2299 8X DVD add \$149

Panther 3m Elite

- same as above with the following
- 850MHz Intel PIII
 - 20GB UDMA Hard drive
 - 128MB SDRAM, TV-out
 - DVD 8X/40X CDROM incl.

Only \$2599

Panther 3v Pro

- 133MHz Bus, FireWire, Video-in/Capture
- Bright 15.1" Active TFT SXGA+ 1400X1050
- 700MHz Intel Celeron CPU, S-Video-out
- 64MB SDRAM, up to 512MB, numeric key-pad
- 5GB UDMA HD up to 32GB UDMA 66
- Internal 24X CD-ROM, 10/100 Ethernet RJ45
- 16MB 128Bit 3D Video, Smart Li-Ion Battery
- Internal 56K Fax/Modem V.90 RJ11
- MS Win 98/ME, 3 year warranty (1yr parts)
- 14" X 11" X 1.96", 9.2lbs., CDR-W optional

Only \$2199 8X DVD add \$169

Panther 3v Exec

- same as above with the following
- 866MHz Intel PIII CPU upgradable
 - 10GB UDMA Hard drive, FireWire
 - 128MB SDRAM, TV-in/out

Only \$2499 8X DVD add \$169

Panther 3v Elite

- same as above with the following
- 1GHz Intel PIII CPU, 133MHz bus
 - 20GB UDMA Hard drive, Firewire
 - 128MB SDRAM, TV-in/out
 - DVD 8X/40X CDROM included

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CARRYINGCASES

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
PORTER CASE (cont.)					
1504 Elite Computer Case	\$399	17.5 x 12 x 7	12	ABS/aluminum	Cort; briefcase-style; accordion portfolio in lid; padded computer ring; 4" ball-bearing wheels; combination lock; 42" ext. handle
1504 Elite Foam	339	17.5 x 12 x 7	11	ABS/aluminum	Cort; 5 layers of gray foam convoluted in lid; no cloth liner; 4" ball-bearing wheels; 42" ext. handle; combination lock
1504 Elite Standard	329	17.5 x 12 x 7	11	ABS/aluminum	Cort; cloth liner w/elastic lid strap; 4" ball-bearing wheels; combination lock; 42" ext. handle



PORTER CASE 1504 Elite Computer Case

QUANTUM CREATIONS					
LapPra	\$149	13 x 11.8 x 2.9	4.5	ballistic PVC	Converts to workstation or backpack; operate computer while standing or sitting; slim style; exp. pockets; legal-size files; protective frame
LapPra Business Edition	99	13 x 11.5 x 3	4.5	Kaskin/nylon	Converts to workstation or backpack; use computer in case while sitting or in vehicle; slim style; exp. pockets; legal-sized files; protective frame
Tutta Campu Cruiser	95	16 x 11 x 6	7.5	PVC	Padded 4-wheel design for stability and easy-glide control; stackable (acts as cart) and collapsible for storage; pockets for accessories & files



Quantum Creations Tutta Campu Cruiser

ROADWIRED					
Compact @ttache	\$ 99	12.5 x 12.5 x 2	2	ballistic nylon	16 compartments; adj. padded interior; removable document organizer; special handle and shoulder pad
iColor @ttache	139	15 x 12 x 3	3	ballistic nylon	Patent-pending color trim tube; 22 compartments; adj. int.; media compartment; removable org.; special handle and shoulder pad
MegaMedia Bag	179	15 x 12 x 3	4.5	ballistic nylon	36 compartments; holds phone; MP3 player, camera, PDA, & accessories; special handle and shoulder pad
Standard @ttache	129	15 x 12 x 3	3	ballistic nylon	22 compartments; adj. padded int.; media compartment; removable document org.; special handle and shoulder pad



RoadWired MegaMedia Bag

SHAUN JACKSON DESIGN					
Lapdag, The Portable Workplace	\$139	12.8 x 10.5 x 2.5	2	nylon/suede	Padded case converts in seconds to functional mobile office; opt. Doggie Bags for additional storage

SPIRE USA					
Atom	\$ 95	18 x 12 x 6	1.9	Corduro nylon	Sleek and lightweight student daypack w/padded, removable computer pouch
Enda	80	16 x 12 x 6	2	Cordura nylon	Roomy, easy-access courier bag w/padded, removable computer pouch
Meta	150	21 x 12 x 9	4.4	Corduro nylon	Technical, load-bearing travel pack w/padded, removable computer pouch

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and sardine
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built for me?

really personalized.



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- Internal 56K Capable* FaxModem
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CARRYINGCASES

SPIRE USA (CONT.)

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
Vurt	\$ 65	15 x 12 x 4.5	1.8	Cardura nylon	Slim "vertical" style shoulder bag w/padded, removable computer pouch
Zoom	120	18 x 12 x 6.5	2.25	Cardura nylon	Comfortable all-purpose daypack w/padded removable computer pouch
Zoom XL	135	19 x 12 x 8	3	Cordura nylon	Large, versatile, & comfortable daypack w/padded, removable computer pouch



Spire USA Endo

SUMEX

Business Briefcase HDR-038	\$69	17 x 12 x 7.5	4.5	ballistic nylon	Pockets for business cards, CDs, & other media; back loops for umbrella and newspapers
Cyberbrief II NKN-817	69	14 x 9.5 x 1.8	4.6	Napa Kaskin	Combo lock; pullman attachable back strap; holders for business cards, CDs, & other media
Leather Slim Notebook Folio GLN-819	69	13 x 13.5 x 1	3.4	full-grain leather	Holds most slim notebooks & digital accessories; removable cell-phone pocket
Mobile Office NKN-818	59	14 x 11.3 x 2.3	5	Napa Kaskin	Exp. overnight compartment; pockets for business cards, CDs, & other media; pullman attachable back strap
Notebrief NKN-002	29	15.5 x 11.5 x 2.3	2.6	cowhide Koskin	Padded computer compartment; ext. document pocket; pockets for business cards, CDs, & other media
Premium Leather Flight Bag GLN-816B	79	13.5 x 10.5 x 2.3	3.6	full-grain leather	Pockets for business cards, CDs, & other media; ext. document pocket; umbrella/newspaper holder



Sumex Leather Slim Notebook Folio GLN-819

T.SHIPLEY

CEO Bag 11-120	\$198	17.3 x 12 x 6.5	5	leather	3 sections; accordion-style pockets; padded laptop case; black, tan
Hobo Portfolio Brief 11-840	145	18 x 14 x 3	3.4	micro dura-fiber	2 wall pockets; arg. panel for cell phone, ID, credit cards; full-length pocket; 2 full-open pockets on either side; removable shoulder strap
Lawyer's Briefcase 11-041	189	18 x 12.8 x 6.5	7.5	full-grain leather	Hand-stitched straps; double handles; protective feet; black, cognac
Leather Traveler's Backpack 11-677	169	14.5 x 12.5 x 7	7	waterproof leather	Padded shoulder straps; large top opening; full interior lining; 2 tapered zipper pockets; nickel buckles
Tusting Clipper Bag 11-331	329	16 x 11.3 x 6	7	waterproof leather	Resists scuffs; snap closure; sturdy handle, detachable strap; roomy int. sections; 2 ext. pockets; tan
Victorinox Laptop Backpack 11-849	179	15 x 5.5 x 16	5.9	nylon	3-way carry system (backpack, shoulder strap, haul handle); shock absorbent; removable suspension system; fan file; cell phone holder; lifetime ltd. warranty
Victorinox Leather Laptop Briefcase 11-848	295	19 x 9.5 x 14	8.1	leather	Removable suspension system; accordion file; cell phone holder; 2 1/2" expansion; shoulder strap; lifetime ltd. warranty



T.Shipley Victorinox Leather Laptop Briefcase 11-848

TAMRAC

Classic VI (15004)	\$225	13 x 11 x 3.5	4.7	ballistic nylon	Classic, top-loading briefcase; exp. document pocket; Piggy-Back packet for riding on top of rolling luggage
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TAMMAG (cont.)

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
Kenyo Computer Satchel (15004)	\$170	14.3 x 10.8 x 3	2.7	nylon/leather	Leather-trimmed flap-top satchel; cell phone/accessories pocket; Piggy-Back pocket for riding on top of rolling luggage
Smart Tate (15001)	150	12.8 x 10.5 x 2	1.9	nylon/leather	Stylish, high-end tote; reinforced w/thick foam; pockets organize CDs, floppies, PDA
Turbo Messenger (15007)	165	15.3 x 10.5 x 3	3	nylon	Messenger style; TurboTop opening; front pocket holds CDs & floppies; Piggy-Back pocket to ride on rolling luggage
X-Pack (15009)	180	13 x 13 x 3	2.4	nylon	Elastic vinyl mesh pocket & bungee cord tie-down; front pocket holds CDs & floppies; file pockets



Tomrac X-Pack (15009)

TARGUS

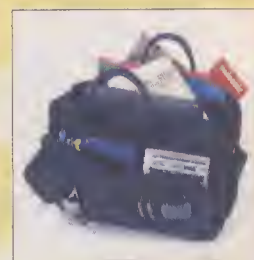
Deluxe Backpack CCB1	\$ 69	13 x 12 x 2	2.7	nylon	Cushioned back pad, business cord & pen/pencil holders, Zip/floppy & file pockets, reinforced handle; non-skid rubber feet
Slimline Leather Top-Loading Case SL300	99	11.8 x 9.3 x 1.4	2.7	leather	Sleek design for smaller notebooks; int. pockets for files, documents, & accessories; self-correcting nylon zippers
Deluxe Backpack CDB1	89	14 x 12 x 2.5	3.9	nylon	Padded strap; self-healing zippers; holds bus. cords, pens, disks, PC Cards; cushioned mesh pad; black
Leather Notebook Case CLN5	99	15 x 11 x 2.5	3.7	full-grain leather	Detachable strap; work from case; holds disks, bus. cords, pens, PC Cards, & files; non-skid rubber feet
Slimline Nylon Top-Loading Case SLN30	49	11.8 x 9.3 x 1.4	2.7	1680-D nylon	Sleek design for smaller notebooks; int. pockets for files, documents, accessories
Top-Loading Air Universal TLUN1A	99	14 x 11.5 x 1.5	3.6	ballistic nylon	Top-load; APS protection; fits all notebooks; shock-absorbing strap; black
Universal Rolling Case CURC1	199	13 x 10 x 2.5	11.6	nylon	Ext. handle; inline skate wheels; fits all notebooks; file storage; 4-way air cushion; std. carry-on



Targus Deluxe Backpack CCB1

TENBA

Access Paks C437	\$220	17 x 12 x 4	3.6	ballistic nylon	Exp. top-load bag; holds printer; org section; int. & ext. pockets; computer-safe insert
Access Paks C624	310	14 x 11 x 4	2.8	leather	Exp. top-load bag; holds laptop & printer; org section; ext. pockets; computer-safe insert
Computer Back Pack Pro C16 CBP-P	200	18 x 12 x 6	3.8	ballistic nylon	Comfortable, sleek, backpack-style; org. section; cell phone pocket; computer-safe insert; compression straps
Computer Traveler C413	160	13.5 x 11 x 4	2	ballistic nylon	Exp. top-load bag; holds phone, drives, handhelds, disks; computer-safe insert; opt. ergonomic shoulder harness (\$30)
Computer Traveler C416	170	16 x 11 x 4	3.8	ballistic nylon	Exp. top-load bag; holds phone, drives, handhelds, disks; opt. shoulder harness (\$30); computer-safe insert
Note Book Office C112	72	15.5 x 12.5 x 2.5	4	600-D polyester	Work from case; accessories pouch; disk pockets; rear zippered pocket; org. panel; zippered file section; detachable strap



Tenbo Access Paks C437

CARRYING CASES

TOM BIHN

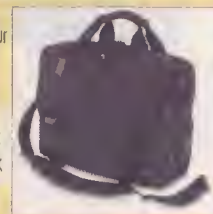
MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
Brain Bag	\$130	18 x 13 x 4	3	Cardura nylon	Large-capacity daypack w/contoured straps; Lap Dog computer case snaps inside; two compartments & pockets
Cofe Computer Cose	80	10.4 x 12.8 x 2.4	11.1	Cardura nylon	Minimalist padded shoulder bag provides room for laptop, power supply, & external drive
Lap Dog	45	12.8 x 10.4 x 2.4	11.2	Cardura nylon	Padded case snaps into Brain Bag & Petite Musette; packet & handles make it a standalone case
Petite Musette	100	15 x 12.5 x 6	2.8	Cardura nylon	Bike-messenger shoulder bag; Lap Dog computer case snaps inside; multiple packets for organization



Tom Bihn Petite Musette

TROGER

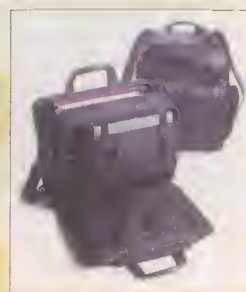
Computer Transpack	\$ 45	11.5 x 13 x 4.3	1.3	plastic	Hard-sided protection for your laptop inserts into your favorite pack; double foam bottom; sizing pillows; handles
Courier Laptop Brief	149	11.5 x 13 x 4.3	3.1	ballistic	Active styling; load-bearing waistbelt; reflective trim; business organization; includes removable Transpack
Cross Country Laptop Convertible	139	11.5 x 13 x 4.3	2.1	ballistic	Vertical shape; hidden straps convert to daypack; business organization; file packet; removable padded laptop insert
Morothon Laptop Brief	189	11.5 x 13 x 4.3	4.2	ballistic	Mega Brief w/accordion file packet; roll-a-board compatible; includes removable Transpack
Rover Laptop Brief	149	11.5 x 13 x 4.3	3.8	ballistic	Sized to accommodate all the essentials without the bulk; briefcase organization; includes removable Transpack



Troger Morothon Laptop Brief

TUMI

Sofecose Computer Briefpock	\$295	15.5 x 13 x 7	4.2	ballistic nylon	Large main section; ext. U-zip pocket; also in Napa leather (\$450)
Sofecose Deluxe Computer Briefpock	350	16 x 13.5 x 8	4.4	ballistic nylon	Main compartment; front exp. file; disk pockets; also in Napa leather (\$495)
Sofecose Deluxe Organizer Computer Brief	350	17.5 x 14 x 8	7	ballistic nylon	Center section holds computer; rear accordion file section; back and front pockets; also in Napa leather (\$575)
Sofecose Expondable Organizer Computer Brief	325	17.5 x 13 x 6.5	4.1	ballistic nylon	Large exp. compartment; exp. file; 4 zippered compartments; also in Napa leather (\$495)



Tumi Sofecose Deluxe Computer Briefpock

ULTIMATE SOLUTIONS

Mobile Office Executive Cose	\$159	17.5 x 13 x 5.5	2.5	leather	2 zippered compartments, 1 padded; front section holds HPC, beeper, phone, etc.; strap
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VANGUARD USA

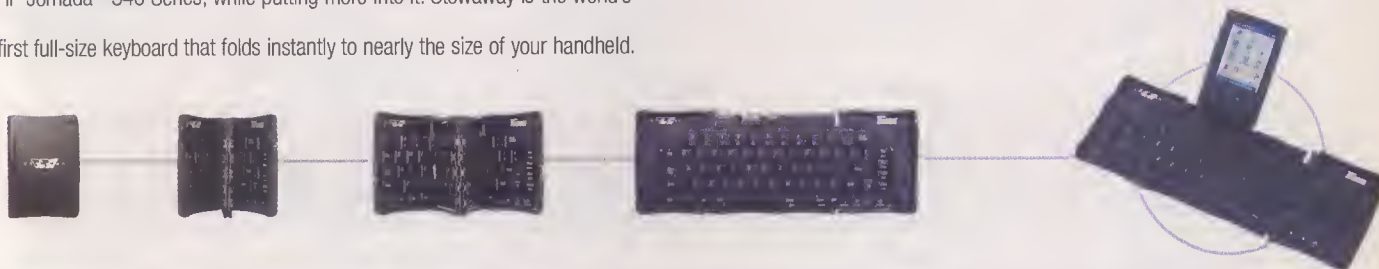
COM-2039	\$65	15.5 x 11.5 x 2.3	4	Kate skin	Leather look and feel; detachable strap; front & back pockets; removable divider; padlock receptacle (lock not included); accessories compartments
COM-2240	90	15.5 x 11.5 x 2.3	5	Kate skin	Leather look and feel; detachable/adj. shoulder strap; zippered pocket; exp. front pocket; removable dividers; padlock receptacle (lock not included); accessories compartments

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Why limit yourself to scribbling with a stylus when you could be typing with all ten fingers? Now you can get more out of your Handspring™ Visor™ or HP Jornada™ 540 Series, while putting more into it. Stowaway is the world's first full-size keyboard that folds instantly to nearly the size of your handheld.



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When you're finished working, Stowaway fits neatly in your pocket. Think how much more you could accomplish with a Stowaway onboard.

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CARRYING CASES

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
VANGUARD USA (cont.)					
Designer 1	\$ 69	15.7 x 10.2 x 1.8	3.8	aluminum	Ultralim design; key locks; removable divider; pockets for CDs, disks, pens, etc.; padded shoulder strap
VGA-7614	80	14 x 10 x 3.3	6	aluminum/PVC	Metal-colored ext. is textured for scratch resistance; key locks; removable/adj. shoulder strap; removable divider; storage compartments
VGA-9323	85	13.6 x 10.4 x 2.1	5	aluminum/PVC	Key locks; removable/adj. shoulder strap; removable divider; storage compartments; silver
VGA-9526	120	18.4 x 12.9 x 2.5	8.5	aluminum/PVC	Key locks; removable/adj. shoulder strap; removable divider; padded int.; storage compartments; black w/metallic gray trim



Vanguard USA VGA-9323

VICTORINOX TRAVEL GEAR					
Lucerne	\$119	12.5 x 19.5 x 7	—	denier nylon	Multifunctional pack w/protective laptop sleeve, CD player pocket, ext. cell phone case, org. panel for accessories and a waist strap
Matterhorn	79	15 x 11 x 5	—	1680 nylon	Messenger bag w/padded, adjustable shoulder strap; laptop computer sleeve; cell phone, water bottle, & organizer pockets
WebGeneral	500	21 x 14 x 10	—	ballistic nylon	3-in-1 bag features duffel bag, removable laptop case, & garment sleeve
WebManager	215	17 x 12 x 5.5	—	ballistic nylon	Exp. main compartment; accordion file; org. panel; ext. phone & water bottle pockets; black leather (\$380)
WebPak	260	15.5 x 13.5 x 10	—	ballistic nylon	Protects and carries computer, files, and accessories; shoulder strap, backpack straps, & handle; black leather (\$395)
WebSak	250	20 x 14 x 5	—	ballistic nylon	Doypack w/protective suspension system; accordion files; org. pockets & ext. cell phone pocket; Keprotek bottom



Victorinox Travel Gear Lucerne

WILLOW DESIGNS					
BC-08 'Round Tawn Briefcase	\$137	15.4 x 12.0 x 4.7	3.0	polyester/nylon	Double-padded laptop compartment; int. work panel; large front org. pocket; exp. folder pocket; lifetime guarantee
BC-09 Cross Country Briefcase	145	15.7 x 12.8 x 5.5	3.1	polyester/nylon	Double-padded laptop compartment; int. work panel; large front org. pocket; exp. folder pocket; lifetime guarantee
BC-20 Inflight Laptop Roller Briefcase	277	19.5 x 13.5 x 8	8.1	polyester/nylon	Durable laptop/printer briefcase on wheels; ext. org. pockets; includes roller case, laptop slipcase, & carry-on luggage maximizer
PK-01 Kerouac Notepack	132	18.7 x 13.5 x 6.3	3.0	polyester/nylon	Double-padded laptop compartment; paperwork section; ext. org. pocket; contoured shape; hideaway flap; lifetime guarantee
PK-02 Thoreau Notepack	130	17.3 x 13.6 x 6.3	2.8	polyester/nylon	Double-padded laptop compartment; paperwork section; ext. org. pocket; contoured shape; hideaway flap; lifetime guarantee
PK-06 Dorwin Notepack	140	20.1 x 13.6 x 7	3.2	polyester/nylon	Double-padded laptop compartment; large paperwork section; ext. org. pocket; contoured shape; hideaway flap; lifetime guarantee



Willow Designs BC-20 Inflight Laptop Roller Briefcase

MODEL	PRICE	INTERIOR DIMENSIONS (in.)	WEIGHT (lbs.)	MATERIALS	FEATURES
ZERO HALLIBURTON					
Z3	\$169	15.4 x 10 x 3	4.5	aluminum	CyberAngel software; 3-digit comba lock; neoprene gasket seal; file & disk packets; lifetime ltd. warranty; silver, gun metal
Z5	199	15.6 x 10.6 x 3	5.6	aluminum	CyberAngel software; 3-digit comba lock; neoprene gasket seal; 2 exp. file packets; 7 accessories packets; lifetime ltd. warranty; silver, gun metal
Z7	249	16.2 x 11.2 x 3.2	12	aluminum	Int. padding; CyberAngel software; 3-digit comba lock; neoprene seal; 2 exp. file packets; 7 accessories packets; lifetime ltd. warranty; silver, gun metal
Z9	399	19.3 x 11.3 x 3	6.9	aluminum	Int. padding; CyberAngel software; comba lock; neoprene seal; 2 exp. packets; 7 accessories packets; wheels; lifetime ltd. warranty; silver, gun metal



ZERO Halliburton Z7

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1695CDT	Celeron® 600	12.1 TFT	64/6/24X/56k	1089.99
2210CDT	Celeron® 500	12.1 TFT	64/6/24X/56k	989.99
2230CDS	Celeron® 600	13 DS	64/6/24X/56k	949.99
2250CDT	Celeron® 600	12.1 TFT	64/6/24X/56k	1149.99

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56k Modem

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
2715DVD	Pentium® III 500	14.1 TFT	64/6/DVD/56k	1399.99
2755DVD	Pentium® III 600	12.1 TFT	64/6/DVD/56k	1299.99
2775DVD	Pentium® III 650	14.1 TFT	64/6/DVD/56k	1599.99
4320DVD	Pentium® III 600	12.1 TFT	64/6/DVD/56k	1499.99
4340DVD	Pentium® III 650	14.1 TFT	64/12/DVD/56k	1799.99
4360DVD	Pentium® III 700	15 TFT	64/12/DVD/56k	2099.99

SATELLITE 2805-S401

Pentium® III 700 Mhz Processor
15" Active Color Display,
128 Mb Ram/20 Gb HD,
8X Max DVD-Rom
56k Modem

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
2715DVD	Pentium® III 500	14.1 TFT	64/6/DVD/56k	1399.99
2755DVD	Pentium® III 600	12.1 TFT	64/6/DVD/56k	1299.99
2775DVD	Pentium® III 650	14.1 TFT	64/6/DVD/56k	1599.99
4320DVD	Pentium® III 600	12.1 TFT	64/6/DVD/56k	1499.99
4340DVD	Pentium® III 650	14.1 TFT	64/12/DVD/56k	1799.99
4360DVD	Pentium® III 700	15 TFT	64/12/DVD/56k	2099.99

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64 Mb Ram/6 Gb HD,
8X Max DVD-Rom, 56k Modem

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
8100	Pentium® III 500	14.1 TFT	128/12/DVD/56k	1699.99
8100	Pentium® III 600	14.1 TFT	64/12/DVD/56k	1899.99
8100	Pentium® III 650	14.1 TFT	128/12/DVD/56k	2099.99
8100	Pentium® III 750	14.1 TFT	128/12/DVD/56k	2499.99
8100	Pentium® III 800	14.1 TFT	128/10/DVD/56k	2799.99
8100	Pentium® III 850	14.1 TFT	128/20/DVD/56k	CALL

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DVD-Rom
56k Modem

\$2299.99

Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
3440CT	Pentium® III 500	11.3 TFT	64/6/Dpt/56k	1599.99
3480CT	Pentium® III 600	11.3 TFT	64/12/Dpt/56k	1999.99
7140CT	Pentium® III 500	13.3 TFT	64/6/4Dpt/56k	1499.99
7200CTE	Pentium® III 600	13.3 TFT	64/12/Dpt/56k	1699.99

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56k Modem

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Model	Processor	Display	Ram/HD/CD/Mod	Price
3440CT	Pentium® III 500	11.3 TFT	64/6/Dpt/56k	1599.99
3480CT	Pentium® III 600	11.3 TFT	64/12/Dpt/56k	1999.99
7140CT	Pentium® III 500	13.3 TFT	64/6/4Dpt/56k	1499.99
7200CTE	Pentium® III 600	13.3 TFT	64/12/Dpt/56k	1699.99

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64Mb Ram/12Gb HD,
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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
F-610	K6-2 550	12.1 TFT	64/6/24X/56k	1099.99
F-630	K6-2 550	13.3 TFT	64/12/DVD/56k	1399.99
F-650	Pentium® III 600	14.1 TFT	64/8/DVD/56k	1699.99
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F-690	Pentium® III 750	15.1 TFT	64/12/DVD/56k	CALL
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F-690	Pentium® III 850	15 TFT	128/30/DVD/56k	CALL

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
XG-29	Pentium® III 750	14.1 TFT	128/18/DVD/56k	2299.99
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Model	Processor	Display	Ram/HD/CD/Mod	Price
Z30J5E	Pentium® III 500	12.1 TFT	64/6/Dpt/56k	1699.99
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1200-125	K6-2 533	13.3 TFT	64/6/DVD/56k	1249.99
1200-325	Pentium® III 650	13.3 TFT	64/6/DVD/56k	1449.99
1200-410	Pentium® III 700	13.3 TFT	64/15/DVD/56k	1699.99

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
1400-244	Celeron® 566	13 HPA	64/6/24X/56k	1099.99
1400-245	Celeron® 566	13.3 TFT	64/6/DVD/56k	1249.99
1400-340	Celeron® 600	12.1 TFT	64/6/DVD/56k	1299.99
1400-345	Pentium® III 650	13.3 TFT	64/10/DVD/56k	1499.99

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
1800-280	Pentium® III 650	15 TFT	64/6/4/DVD/56k	1899.99
1800-390	Pentium® III 850	15 TFT	128/20/DVD/56k	CALL

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
1700-360	Pentium® III 600	14.1 TFT	64/10/DVD/56k	1599.99
1700-365	Pentium® III 700	14.1 TFT	128/15/DVD/56k	1799.99
1700-375	Pentium® III 750	14.1 TFT	128/20/DVD/56k	2199.99
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M300	Pentium® III 600	12.1 TFT	64/12/Dpt/56k	1799.99
M700	Pentium® III 700	14.1 TFT	64/12/DVD/56k	2699.99
M700	Pentium® III 750	14.1 TFT	64/12/DVD/56k	2999.99
M700	Pentium® III 850	14.1 TFT	128/20/DVD/56k	CALL

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DVD-Rom, 56k Mod.

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Model Processor Display Ram/HD/CD/Mod Price

Model	Processor	Display	Ram/HD/CD/Mod	Price
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E500	Pentium® III 700	15 TFT	64/12/DVD/56k	2299.99
E500	Pentium® III 800	14.1 TFT	64/10/DVD/56k	2199.99
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T21-57U	Pentium® III 850	14.1 TFT	128/32/DVD/56k	3499.9
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1260i-260	Celeron® 550	13.3 TFT	64/6/24X/56k	1249.99
1200i-41U	Celeron® 550	12.1 TFT	64/5/24X/56k	1099.99
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COMING SOON TO YOUR OFFICE AND HOME: Wireless LANs

The 70-plus Wi-Fi products on the market today are introducing growing numbers of laptop users to wireless local area networks.

by Scott Phillips

While all types of devices are going wireless—handheld computers, laptops, Internet appliances—wide area wireless isn't always where the action is. In fact, for laptop users, high-speed wireless *local* area networking could be much more exciting.

The big benefit of a wireless LAN is the freedom to work with a laptop anywhere you want within range of a wireless base station. Imagine using the same wireless networks at home that you use at work.

It's not yet clear which type of wireless networking technology will prevail. Leading the competitors are 802.11b High Rate Wireless networking, also called Wi-Fi, and HomeRF. Although HomeRF is cheaper and more easily supports a channel for voice communications, Wi-Fi now seems to be leading.

Dozens of Wi-Fi products have hit the shelves, geared to home and business users. What's more, before they reach the market, they must pass independent testing to get the Wi-Fi interoperability label. That means you can, for example, use a D-Link networking card with a 3Com wireless LAN hub.

According to the Wireless Ethernet Compatibility Alliance (WECA), the non-profit industry association that tests and certifies Wi-Fi products for interoperability, over 70 products are on the market—base stations and access cards—from 30 vendors.

WECA (www.wi-fi.org) was formed in 1999—it now has 76 members—to promote the adoption of high-speed,



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wireless local area networking based on the IEEE 802.11b High Rate networking standard. The standard uses the 2.4-GHz radio band and operates at a raw data rate of 11 Mbps, which results in an actual throughput of 5.5 to 6.5 Mbps, the same as wired Ethernet.

"Leading companies from around the world have continued to join the WECA ranks since its inception a little over a year ago," says David Cohen, vice chairman of WECA. "It is very clear that it is the value of the Wi-Fi certification process that is driving our membership growth. These companies are finding it increasingly important to become part of the unprecedented momentum in the wireless LAN space."

At the same time, however, many WECA members also make products using HomeRF technology—effectively hedging their bets in the wireless LAN market. The key to WECA's and Wi-Fi's success, however, is most likely that the business world is already using Wi-Fi products.

When people realize they can use the same wireless networking technology at home that they use at work, they generally go for it. Indeed, many users will first find out about wireless networking at the office. Furthermore, the very name of HomeRF is likely to exclude it from consideration by business.

In general, three issues are likely to push wireless networking in the home: broadband Internet access, multiple devices, and Internet appliances. The growing availability of home Internet access over cable and DSL is increasing Internet bandwidth in the home. The popularity of second and third home computers, not to mention laptops, is making home networking a necessity. Adding network-enabled devices will require even more connectivity. Coupling wireless networking with a broadband connection addresses all these issues at once.

Down the road, however, the best part of Wi-Fi could be outside the home—in its widespread implementation. Imagine being able to log on via wireless at home, in your office, in a client's office, coffee shop, or airport waiting lounge. All seamless. All instant. □

A New Phone Form Factor from Motorola

Once upon a time, Motorola owned the cellular phone business. Its original flip-style analog cellular phones were the envy of the early tech set. Later, its StarTAC series were likewise cutting-edge fashion. Then things changed. The wireless world went digital. In rushed the Nokias and Ericssons of the world. Motorola lost its lead.

Nokia, Ericsson, Qualcomm, and their ilk beat Motorola out of the gate with digital phones. Their designs were better suited to the integrated voice/data demands of digital wireless systems. It has taken Motorola some time to recover. Now, it's pushing the form factor envelope again.

Already in the U.S., Motorola is advancing its tiny two-way messaging device, the Talkabout T900 Personal Interactive Communicator. The T900 is a clamshell unit about the size of a matchbox. It's available in Raspberry Ice, Black Opaque, Mystic

Blue, and Aqua Ice, and breathes new life into the ReFLEX two-way paging technology. Check it out at www.motorola.com.

That's not all. It looks like Motorola has more going on with this type of form factor than just two-way messaging. It has used it for a tiny WAP phone, too, which carries the catchy names the V.Box or V.100. Available now for GSM markets abroad only, the V.100 has data and voice connectivity. You speak and listen using a plug-in headset. A version running on the 1,900-MHz U.S. GSM network is scheduled for U.S. release in mid-2001.

The tiny unit offers up to three hours of talk time, with 125 hours of standby time. Eleven ring tones are available, as is a silent, vibrating alert. Looking for a fashion-conscious and wearable converged voice/data device? This is it. □



College Technology Essentials

A computer and a cell phone are essential college gear. According to one recent study, students are rapidly adopting cell phones, often instead of wired phones. (Indeed, Motorola's V.100 is likely to be aimed directly at buyers in their late teens and early twenties.)

After all, students are highly mobile. They often travel on weekends, and they spend all day in various campus locations. Evenings, they're in libraries and class, weekends at parties. Local communication is often face-to-face or via e-mail. Phone time is for making long-distance calls home.



More relevant, students often change dorm rooms or apartments every year. That means disconnecting and reconnecting a phone every year. What a drag.

Wouldn't it be easier to go wireless? A

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recent study at the University of Denver by the Daniels College of Business (www.du.edu) found that 60 percent of UD undergraduates use mobile phones. Furthermore, they spent a whopping \$1.5 million in setup fees and monthly charges in the past year. That comes to \$740 per student!

Although all types of students carried cell phones, the results were somewhat predictable based on majors. Business majors, for example, were most likely to have a cell phone. (Are they more business-savvy, or more easily swayed by marketers?)

Humanities students, on the other

hand, were least likely to have a cellular phone. (Are they technology holdouts, or do they have better things to do than talk on the phone?)

Perhaps it's just an age thing. The study found that cell phone use increased by class, with seniors most likely to have a phone. □

Old Palms Go Online, Too

Using an older Palm organizer doesn't exclude you from going online. Older Palms can get online access, too, by connecting to a cellular phone.

The centerpiece is a \$39 software product called the Palm Mobile Internet Kit. It runs on top of PalmOS 3.5 and provides access to e-mail, the Web, and Palm Web-clipping applications.

The software runs on a Palm m100, III, IIIx, IIIxe, IIIC, or V series handheld organizer. The organizer can connect to a cellular

phone via infrared connectivity or a data cable. A list of phones tested and certified for interoperability is at the Palm Web site (www.palm.com/software/mik/phone.html). Phone manufacturers include Ericsson, Motorola, Nokia, Qualcomm, Samsung, and Siemens.

The e-mail support in the Mobile Internet Kit provides access to e-mail on Yahoo!, Hotmail, and POP3 and IMAP4 accounts. The advantage of this approach is that you don't have to pay a separate monthly access charge to go online with your Palm organizer. Instead, you just use air time on your (or anybody else's) cellular phone to dial an ISP and get online.

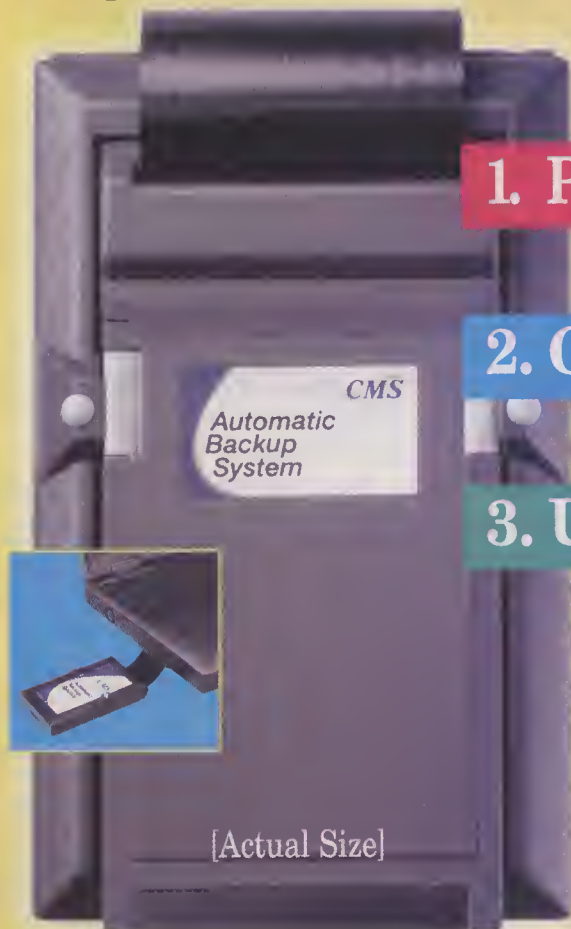
The disadvantage is that you need to juggle two devices. There are few on-the-go circumstances that are conducive to operating a phone and PDA while keeping their IR ports aligned.

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EVENT-PLANNING ONLINE

Whether it's a seminar for a few dozen or a convention of thousands, planning can be a lot smoother and cheaper using an online service.

by Diana K. McLean

Corporate events such as meetings, seminars, conventions, trade shows, incentive travel, and teambuilding programs have led to a boom in the event-planning business. It takes a lot of work and coordination to pull off a large-scale event and have all the details work smoothly.

Event planning used to involve a lot of phone calls, interviews with professionals, and quite a bit of driving to check out facilities and other details. The Internet has changed that picture considerably. There is a variety of sites and services available to assist you, whether you're planning a professional or personal event.

Depending upon how much help you want, you can take advantage of online resources to plan your own event, or use the Internet to employ a full-service event planner who will take care of the details for you.

The services you can expect to find offered at many of these sites can be organized into three basic categories: pre-event planning and budgeting, marketing and promotion, and onsite event management.

Pre-event services cover a vast spectrum of details, starting with selecting a site and negotiating the price and services to be included. Arrangements must be made for attendees' lodging, food and beverages, and travel plans. An event program must be developed, including meeting room schedules, guest speakers, and possibly entertainment. Other activities might be planned for attendees or for their spouses

or guests who will not be attending the business meetings.

Marketing and promotional activities may include designing brochures and other printed materials, creating registration forms and setting up online registration, printing and mailing programs to participants, sending out mailings or making telephone calls to potential attendees and speakers, and arranging for promotional gifts for attendees.

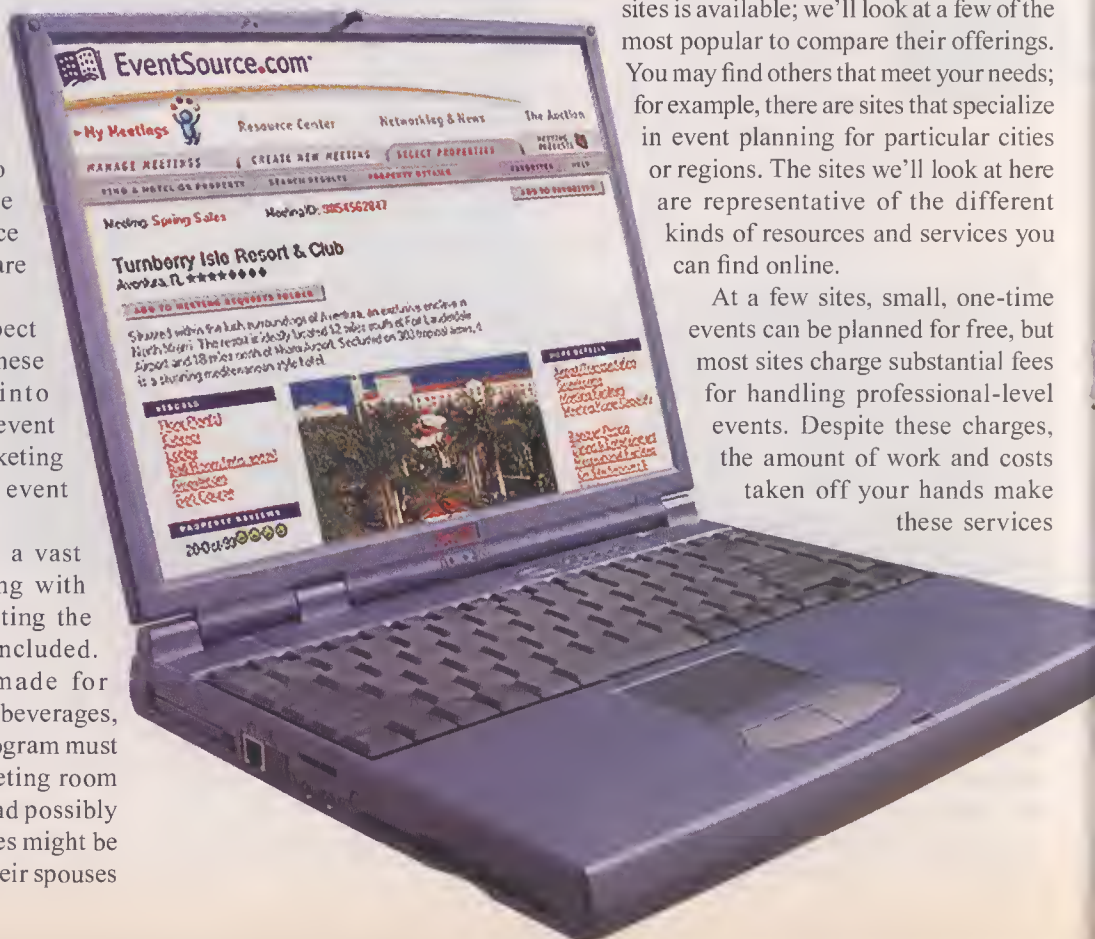
Onsite management at the event may include site coordination and troubleshooting of any problems,

computerized registration, staffing a welcome/registration desk, providing welcome packets and name badges for participants, and providing binders with the program materials.

Companies and Sites To Explore

A wide variety of event-planning Web sites is available; we'll look at a few of the most popular to compare their offerings. You may find others that meet your needs; for example, there are sites that specialize in event planning for particular cities or regions. The sites we'll look at here are representative of the different kinds of resources and services you can find online.

At a few sites, small, one-time events can be planned for free, but most sites charge substantial fees for handling professional-level events. Despite these charges, the amount of work and costs taken off your hands make these services



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well worth their cost. They will no doubt save you money as well as time and stress when planning your events.

Conference Connections

Conference Connections is a full-service event planner that takes care of the planning for you rather than providing tools for your use. The company offers comprehensive pre-event planning services.

Conference Connections will help you select a site and make arrangements with the site staff for meeting rooms and food and beverages. They can also help you obtain group discounts for airline travel, and will help arrange ground transportation in the destination city. They will arrange entertainment for conference attendees and their guests.

The company will design marketing materials, such as brochures, programs, pre-event mailings, and promotional gifts, and then coordinate the printing and mailing of pre-event literature. They'll even place telemarketing calls to potential attendees. They will also create registration forms and/or online registration sites to make registration as simple as possible for attendees.

In terms of planning the overall program, they take care of details, such as speakers, entertainment, and binders containing any materials needed by attendees.

When participants arrive at the event, they may be met by Conference Connections registration desk personnel, and provided with welcome packets and laser-printed name badges. Onsite staff will also be available to troubleshoot any problems that may arise.

To fill the hours between business meetings, or to entertain attendees' spouses or guests, Conference Connections can plan such events as city tours, shows, shopping, or golf or tennis outings.

Pricing for Conference Connections' services is determined on an individual client basis.

eRSVP.com

Another service, eRSVP.com, creates a dedicated Web site for your event. You can select from over 40 templates offered by eRSVP, or have the company's

design team create a custom template. For example, if you already have a company Web site, eRSVP can create an event site that complements your corporate site.

Attendees can register for your event online, anytime. You can also use the site to provide your guests with an event description and agenda, information on the destination, even maps to the event. Guests can leave messages on your event bulletin board, or learn how to contact the event planner for more information.

eRSVP can create plain text or graphical e-mail invitations and announcements using your event theme, corporate identity and logo, or target audience. E-mail can be your primary invitation method, or used for follow-up communication. Announcements can be used to send updates to attendees.

You can have the company create surveys for your guests to complete during registration, including multiple-choice, text, or yes/no questions to get the specific feedback you seek.

eRSVP will build an online guest database, allowing you to track guests' personal information, attendance activity, and preferences. You can use the database to conduct pre-event marketing to former attendees when you plan events in the future, or to send follow-up surveys or thank-you notes to participants. Customers can access instantaneous reports and event summaries.

Even the financial transactions can be handled by eRSVP. You can use your event site to conduct online ticket sales for your event, securely charging your guests' credit cards. You can also use this technology to collect donations for a charity, association, or candidate. You can use eRSVP's MyAssociation feature to collect membership dues and track registrations for your entire organization.

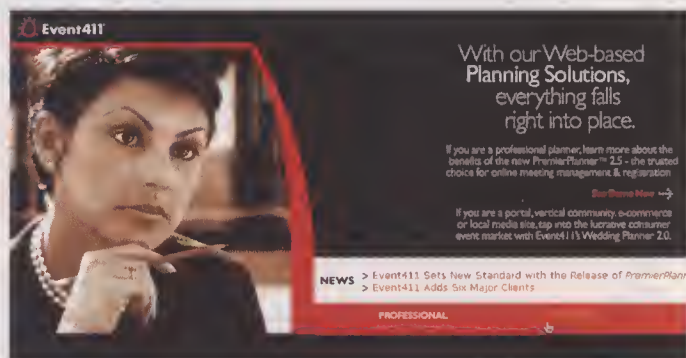
eRSVP membership is free. Before committing to the company's fee-based

services, you can try out a test event on the eRSVP Web site. This free test event includes an unlimited number of invitations and up to ten responses.

Pricing for eRSVP's fee-based services includes a \$25 setup fee for each event. For non-ticketed events, each RSVP costs \$1; for ticketed events, each RSVP costs \$2.50, plus a four-percent commission. If you do a lot of ticketed events, you can create a merchant account for \$1,050, which eliminates the four-percent commission fee.

Event411

Event411 has the distinction of having been the online event-planner for the 2000 Democratic Convention. The company is an application service provider (ASP) that



Event411

provides Web-based software to help both consumers and professionals with event planning. The fact that it was selected by the Democratic National Convention Committee (DNCC) to help coordinate an event with more than 30,000 participants indicates that this service can help planners handle events of all sizes.

The company's professional product, PremierPlanner 2.5, makes life easier for event planners and for attendees. Features include online registration, an event information center to provide information to attendees via the Web, and personalized home pages for each attendee, where they can check agendas, get current information, and communicate with you and with each other.

Planners have a wide range of features at their disposal to assist in the planning process. The Admin Center lets you configure your event site the way you want it, managing preferences and levels

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EventSource.com MY INFO LOGOUT

My Meetings Resource Center Networking & News The Auction

MANAGE MEETINGS CREATE NEW MEETING SELECT PROPERTIES MEETING REQUESTS

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Meeting: Spring Sales Meeting ID: 9854562847 ADD TO FAVORITES

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Aventura, FL ★★★★★

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Situated within the lush surroundings of Aventura, an exclusive enclave in North Miami. The resort is ideally located 12 miles south of Fort Lauderdale Airport and 18 miles north of Miami Airport. Secluded on 300 tropical acres, it is a stunning mediterranean style hotel.

VISUALS

- Floor Plans
- Exterior
- Lobby
- Ball Room (Info room)
- Guestroom
- Golf Course

PROPERTY REVIEWS

20-Oct-99

Full review

SUBMIT REVIEW

For more information about this property, contact EventSource.com toll-free at (877) 432-9100 or click here for detailed hotel information.

HOSE DETAILS

- Airport/Transportation
- Guestrooms
- Meeting Facilities
- Meeting Room Capacity
- Ballroom Pricing
- Dining & Entertainment
- Recreational Facilities
- On-Site Services & Shops
- Credit Policy
- Local Attractions

KEY STATISTICS

Type: Resort	Total Meeting Space: 45,000 sq ft
Locale: Suburban	Total Capacity: 1,700 People
Guestrooms: 395	Largest Room: 12,096 sq ft
Suites: 42	Foyer Capacity:
Club Level Room: 0	Second Largest Room: 7,020 sq ft
Ball Room Rate: High Med Low	Foyer Capacity:
S/D \$465 \$360 \$350	Total # of Mtg Rooms: 19
Suite \$3,500	Total # of Breakout Rooms: 27

EventSource

of access and control. The Attendee Manager stores information on your attendees, simplifying such tasks as checking confirmation status and printing badges. A report tool generates custom reports tailored to your needs.

The Master Planner feature creates a master schedule of date, time, and location information for each event. The Message Manager allows you to send messages to individual attendees or to the whole group, making it simple to inform attendees of any changes. The Expense Tracker and searchable vendor list helps you keep track of budgeting and payments. The Task Manager helps you keep track of tasks you need to complete or delegate to someone else. The Travel Manager helps you handle hotel and travel arrangements. The Photo Center lets you post pictures during and after your event.

Jennifer Stevenson, director of marketing for Event411, explains the company's pricing plans. "PremierPlanner 2.5 is available for corporations and organizations starting at \$15,000, which covers standard setup and integration. This fee includes the following tools: Attendee Manager,

Registration, Event Info Center, Message Manager, Master Planner, Task Manager, Expense Tracker, Vendor List, Contact List, Travel Manager, Photo Center, Admin Center, and Reports.

"Select Services are available for an additional price, and include Housing Manager, Payment Processing, Call Center and the Platinum Service Package. The client is responsible for a per-user attendee fee, which is based on the client's total annual attendee participation. For the first 10,000 attendees, the cost is \$5, however, pricing decreases with more than 10,000 attendees,

to as little as \$1 per person. One day of basic training, quality testing prior to launch, free product upgrades for the first 12 months, and unlimited client support during the first 90 days are also included free of charge. Additional training, technical support, data conversion, and tool configuration are provided for small hourly fees."

EventSource

EventSource is a business-to-business service for meeting planners. The services offered on eventsource.com are divided into easy-to-use sections. My Meetings is where planners go to find meeting locations. You simply enter a request, and receive quotes within 24 hours from hotels that match the criteria in the request. All you have to do is choose the one you want to accept, saving yourself lots of time spent calling around for the best rates.

The Auction is another way to save time—and money—when planning an event through EventSource. You complete a request for proposal (RFP), work with EventSource to determine

which hotels you'll invite to participate, establish the length of the auction, and let hotels bid for your business. On average, according to EventSource, it saves planners 33 percent.

The Resource Center provides information on hotels and other properties, airlines, and suppliers of other services, such as catering and audio-visual equipment rental. It also offers city guides for many cities.

Networking & News offers a range of information of use to event planners, including property reviews written by event planners, and a monthly newsletter for planners.

The MarketPlace provides merchant offers on a variety of products and services for your event, including promotional gifts, ground transportation, photography, and more.

Compass provides companies with a private, customized version of the EventSource meeting-planning Web site to help track and manage meeting costs and implement travel policies.

EventSource is free to planners; the service earns a commission for hotel bookings.

seeUthere.com

One of the leading event-planning services, seeUthere.com, offers two basic services. The first, which was the original service offered at this site, is now called seeUthere Express. This service, designed for infrequent event planners and consumers, is a basic invitation and RSVP management service, and operates on a self-service, pay-as-you-go transaction fee model.

There are three modules of this ASP service. Automation tools are provided for managing event registration, confirmations and reminders; surveying and profiling attendees; and delivering real-time status reports. An event-marketing engine lets planners create a branded event microsite, manage marketing campaigns, and expand their reach via e-mail, fax, and regular mail. The seeUthere Global Attendee Database provides tools to help planners evaluate costs and revenues across multiple events, analyze attendee profiles

see@there
PROFESSIONAL
Web-Powered Event Automation

Registration Summary

Report Name: Event Group Details
Event Name: McLife's 2001 Institutional Leaders Conference
Reported as of: 12/21/2000

Name: seeUthere.com
Login: sus_grosales2@seeucorp.com

Showing 1-25 of 31

Group Name	Attendee	Quantity
Specialist Course	Jonathan Khorsandi	1
Specialist Course	Dave Pitts	1
Specialist Course	Ray Thackeray	1
Specialist Course	Joel Wiener	1
Specialist Course	Melva Frolichman	1
Specialist Course	Ben Hagren	1
ATV Adventure Tour	Jonathan Khorsandi	1
ATV Adventure Tour	Dave Pitts	1
ATV Adventure Tour	Ray Thackeray	1
ATV Adventure Tour	Joel Wiener	1
Specialist Course	Melva Frolichman	1
Specialist Course	Ben Hagren	1
ATV Adventure Tour	Jonathan Khorsandi	1
ATV Adventure Tour	Dave Pitts	1
ATV Adventure Tour	Ray Thackeray	1
ATV Adventure Tour	Joel Wiener	1
ATV Adventure Tour	Joel Wiener	1
ATV Adventure Tour	Ben Hagren	1
ATV Adventure Tour	Joel Wiener	1
City Tour	Jonathan Khorsandi	1
City Tour	Dave Pitts	1
City Tour	Ray Thackeray	1
City Tour	Joel Wiener	1
City Tour	Ben Hagren	1
City Tour	Joel Wiener	1
City Tour	Joel Wiener	1
City Tour	Dave Pitts	1
Hotel/Bedch. Package	Ray Thackeray	1
Hotel/Bedch. Package	Joel Wiener	2
Hotel/Bedch. Package	Melva Frolichman	1
Hotel/Bedch. Package	Joel Wiener	1
Hotel/Bedch. Package	Jonathan Khorsandi	1

Showing 1-25 of 31

seeUthere.com

and attendance histories, and create exportable reports.

In September 2000, seeUthere.com expanded its services to include corporate and association clientele in addition to independent event planners. The new service, seeUthere Professional, is subscription-based and targets conference planning, seminars, training courses, incentive events, and other professional meetings. Among the features of the service are marketing-campaign management, multiday registration, detailed attendee profiling, and comprehensive reporting capabilities. Consulting services are also available for those who want help from start to finish.

"seeUthere.com is a subscription-based service, and pricing is determined based on length of access to the services," explains April Whitney, public relations manager for seeUthere.com. "We have pricing options for event planners who hold both infrequent and frequent events. Our basic annual pricing (for seeUthere.com Professional) is \$12,000, and includes the following: one day of training for one person; five hours of consulting; and unlimited customer support up to 20 events."

There is a \$3-per-registrant handling fee, and a processing fee of 4.75 percent. There is also a \$1,000 one-time account setup fee.

seeUthere.com Express offers the following free services: online invitations; online registration/RSVP to a free event; event Web page; club or organization Web page; venues and suppliers search; and address book.

With the Express service, online registration/RSVP to a ticketed event costs \$9.95 for the initial setup, \$1 per ticket, and another 4.75 percent of the total transaction. Telephone registration/RSVP costs \$9.95 for setup fee, plus 20 cents per minute. Invitations via fax cost \$9.95 for setup, plus 20 cents per fax. Online charging of donations costs \$1 per donation, plus 4.75

percent of the total transaction. Online charging of membership dues costs \$1 per member, plus 4.75 percent of the total transaction.

Now that you have an idea of the kinds of event planning help you can find online, check out the details on each site to find the best match for your needs. Whether you opt for an ASP, or a full-service event planner, your next event should be less stressful to plan. □

Conference Connections
(408) 865-6931
www.conferenceconnections.com

eRSVP.com
(212) 201-7799
www.ersvp.com

Event411
(877) PLAN-ON-IT
www.event411.com

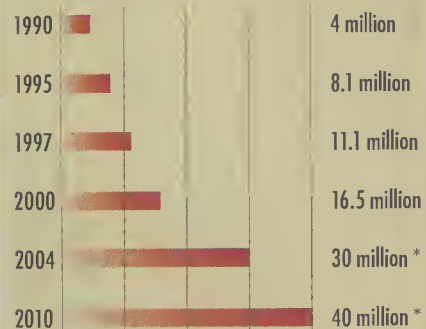
EventSource, Inc.
(877) 492-9100
www.eventsource.com

seeUthere.com
(408) 562-1090
www.seeuthere.com

Telecommuting on the Rise

As technology continues to advance, more American workers are able to telecommute. Experts predict a continued growth in this field as companies take advantage of improved communications technology and wider Internet bandwidth.

Number of telecommuters in the U.S.



* Estimated

Sources: International Telework Association & Council (ITAC), October 2000 and Telecommute America

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International Domain Names Stir Debate

Until last fall, while Internet sites were established around the world, their names were not representative of the diversity of their locations. The domain name addressing system only accommodated the Roman alphabet and the digits zero through nine. That system excluded the majority of the world's languages, some of which use characters not included in the Roman alphabet, and others that use entirely different alphabets.

In November 2000, VeriSign Global Registry Services, the company in charge of Internet domain names ending in .com, .net, and .org, began accepting Chinese, Japanese, and Korean characters for domain names—without approval from the computer engineers who set standards for the Internet. Within the first few days, tens of thousands of domain names were registered using non-English characters.

Reactions have been mixed to the registration of Internet domain names using Chinese, Japanese, and Korean characters. While some hail the move as a step toward making the Internet more

truly international, others are concerned about the impact it may have.

Advocates of the new international domain names say it's a long overdue move to make the Internet truly global. However, there are no worldwide standards for non-English characters, which leads some experts to believe that there may be confusion or even damage as a result.

One major concern among experts is that domain name servers were originally programmed with English in mind, and many (tens of thousands) of those machines will not understand new languages without software upgrades. Until that happens, users could be blocked from many sites.

In addition to the server issues, individual users are likely to need to make changes. Those of us in the English-speaking world use keyboards set for English characters. In order to be able to type in non-English Internet addresses, we will need to modify some settings on our computers, and add character sets for other languages. (Many computers sold

in other parts of the world are already set up to be able to create characters in those languages.)

In addition to concerns about technical difficulties, the move to expand the domain names led to a debate between the U.S. and China about who has the right to sell Chinese-language domain names. Officials at the China Internet Network Information Centre (CNNIC) argue that VeriSign's action infringed upon China's sovereignty. In response, CNNIC has been selling its own version of Chinese registration with the ".cn" extension. By early December, the group had received around 820,000 registrations. As a result of the competition between U.S. and China over sales of domain names with Chinese characters, many individuals and businesses have opted to register with both services, fearing that they might lose out in the future.

While we can't predict what the outcome of all of this will be, it is certain that the world of Internet domain names has changed dramatically. □

Internet Postage May Cost Less Than Buying Stamps

Concerned about the latest rise in first-class postage? Tired of having to buy one-cent stamps to supplement your old stamps, each time the Postal Service raises its rates? Consider buying postage online. It may save you not only time and frustration, but money as well.

Consumers and businesses may be able to save money on postage by using online mail or shipping services, such as Stamps.com. Last fall, the U.S. Postal Rate Commission recommended the creation of a discounted rate for First Class mail sent using Internet postage. If the Governors of the U.S. Postal Service agree, it's likely the Postal

Rate Commission will chop four cents off each item posted through an online mail or shipping service.

The discount may revive the online postage business. Last October, Stamps.com laid off 240 employees following the resignation of several high-level executives, including the chief executive. In November, E-Stamp Corp. announced its withdrawal from the online postage market and laid off about 30 percent of its employees. This followed a 25-percent staff cutback in July. After the announcement from E-Stamp, Stamps.com affirmed its commitment to the online postage business and expressed confidence in the

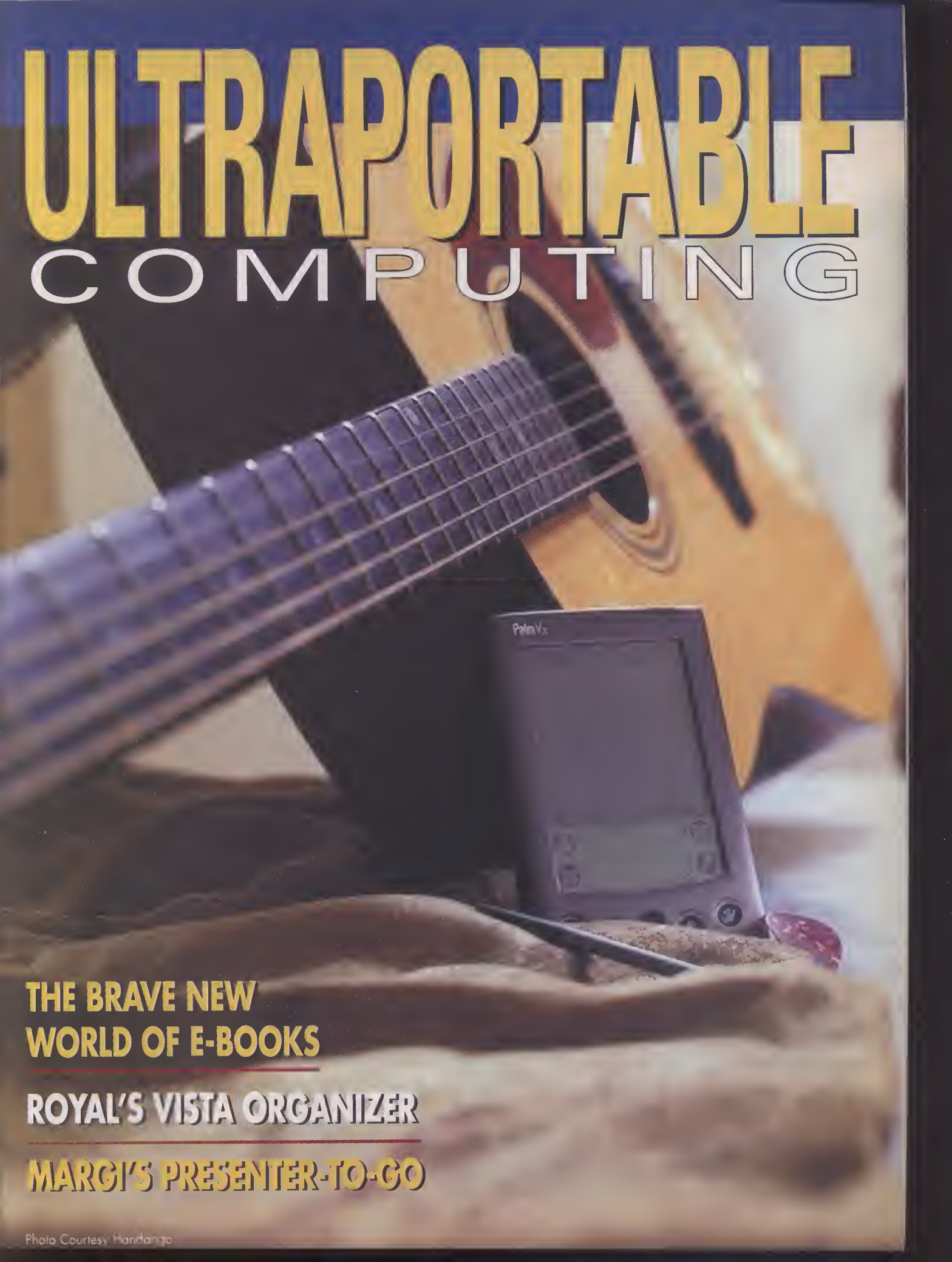
future of online postage sales.

Stamps.com began lobbying in 1999 for a reduction in postage rates for stamps purchased online. The proposal includes industry-wide savings of four cents for online postage. The reasoning behind the proposal is that processing stamps through the Web is both more efficient and less costly than traditional means.

In November, the U.S. Postal Rate Commission endorsed a new class of mail that would allow a discounted rate on Internet postage. That endorsement is only the first step in the process to allow a reduction in cost for postage purchased online. The next step is for the Governors of the U.S. Postal Service to review the proposal. They may ratify, approve, or deny the proposal. The final decision will then be made by the Postmaster General. ■



ULTRAPORTABLE COMPUTING

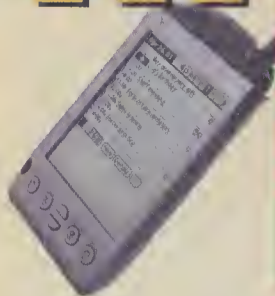


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MARGI'S PRESENTER-TO-GO

HPC



HQ

New Products and Services for Handheld Computers

Edited by Rosalia Ferraro

AFFORDABLE ORGANIZER

If you're looking for an affordable PDA, try the Royal Vista. This card-sized organizer comes with a detachable pocket-sized keyboard.

The Vista offers easy data entry and PC synchronization with Royal Link PC Personal Information Manager software, as well as Microsoft Outlook, Schedule+, ACT!, Goldmine, Lotus Organizer, and Palm Desktop.

The Vista features an address/phone book, calculator, scheduler, home and world time, expense manager, and more. EZTouch keys allow for simple access to Contacts, Schedule, ToDo List, and Anniversary information. The onscreen number pad makes calculations and metric and currency conversions simple. The Vista comes with a folding, wallet-style case that can also serve as a business card holder.

The Royal Vista is PC compatible and is available for \$60.

Royal Consumer Business Products; (800) 255-7998; www.royal.com.



LIGHTEN YOUR LOAD

Handspring Visor owners looking to improve their multimedia presentations need look no further. Margi's Presenter-to-Go is a Springboard module that allows Visor users to connect directly to a digital projector or other VGA display and make high-resolution color presentations without a laptop.

Download presentations from your PC to Presenter-to-Go via a HotSync connection. The module comes with drivers that compress files from any printable Windows 98- or Me-compatible program into a format that can be transferred to a Visor handheld.



Once the files have been transferred to your Visor, you hold the power of your presentation in the palm of your hand. Imagine walking into an important meeting unencumbered by a bulky laptop. Simply connect to a projector, tap the Presenter-to-Go icon on your Visor, and make a 1,024 x 768-resolution presentation. The presentation can be run from anywhere in the room using the included IR remote control.

Once presentations are loaded into the Visor, you can rename slides, hide and "unhide" slides, view slide notes, and more. An included 12-inch VGA cable connects the module to your display device. It can be powered using the included AC adapter, an optional battery pack, a Handspring power cable, or the cradle of the Visor Prism model.

Presenter-to-Go costs \$299.

MARGI Systems, Inc.; (510) 657-4435; www.presenter-to-go.com.

POCKET TRANSLATOR

What time is it? A fairly simple question, but when you're traveling in Italy, saying it in English just won't get you the answer.

Lernout & Hauspie has introduced a limited version of its iTranslator program for Palm VII users. All you have to do is type in, "What time is it?" and your translated answer will show up, "Che ora sono?" It uses sophisticated linguistic-processing technology to translate sentence by sentence, unlike ineffective word look-up software. This results in more understandable, more accurate, and ultimately more effective translations.

iTranslator supports the following language pairs: English/French, English/German, English/Italian, English/Portuguese, English/Spanish, German/French, French/Italian, and Spanish/Italian.

You can also choose from topic vocabularies, such as general, business, computers, legal, and medical.

iTranslator is available at no charge from the L&H Web site. L&H does not provide technical support for this product.

Lernout & Hauspie; (800) 380-1234; www.lhsl.com.

LOCK ON THE RUN

An investment in a PDA is not just financial, it's personal. PDAs hold essential, personal information that you really can't afford to lose; you need to keep it safe and secure. Let Kensington's PDA Saver do the job.

This is the first physical security device available for personal digital assistants. Its design allows quick and easy use, and it won't interfere with the PDA's docking cradle.

The PDA Saver attaches through the PDA's stylus slot, and avoids damaging or defacing your hardware. Its six-foot galvanized steel cable anchors your PDA to an immovable object. It's compatible with all Palm series organizers (except the Palm V), as well as the Handspring Visor and Visor Deluxe, IBM WorkPad and WorkPad Companion, and Symbol Technologies organizers.

A lifetime warranty backs the PDA Saver. You get a 90-day trial and toll-free technical support. It costs \$39.

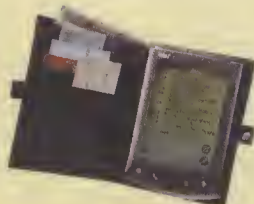
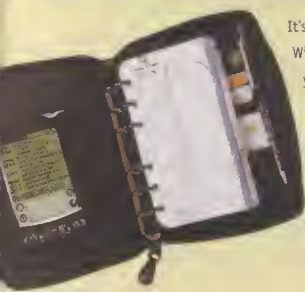
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GET ORGANIZED

Everyone would like to get organized, but it comes easier to some than to others. Those who are on the run don't always have the time to organize ideas and notes on paper, and there's also the risk of losing those pages.

ThoughtManager 2.0 from Hands High Software can help you get organized and much more. It brings project management, personal idea organization, outlining, and note-taking capability to the Palm platform. ThoughtManager allows you to share outlines with other ThoughtManager users and save outlines as templates.

When a Palm handheld is synchronized with a desktop PC or Mac, ThoughtManager copies its Palm outlines to the desktop. These outlines can be sent to other ThoughtManager users by attaching them to an e-mail or posting them on a Web site.

Other product enhancements include attachable notes and drawings, selectable fonts, support for color Palm devices, and improved speed.

ThoughtManager 2.0 costs \$19.95 and includes a free 30-day trial.

Hands High Software, Inc.; www.handshigh.com.



SAFETY CLIP

You're on your way to see the CEO of your company with some exciting new ideas to share. To save time and paper, you store your crucial notes in your handheld. Suddenly, someone rushes past you, knocking your handheld to the ground. The screen goes blank and you can't get it running again. Terrified? You should've been using quikCLIP.

The quikCLIP can eliminate costly drops and falls by allowing you to securely fasten your organizer to your shirt pocket, belt, or wherever else is convenient.

The device is compatible with all Palm and Handspring devices, many cellular phones, most handheld games, and many MP3 players.

The quikCLIP is available on the company's Web site for just \$9.95. It could be a lifesaver.

quikCLIP; www.quikclip.com.



CLICK AND TASTE

The lifestyle associated with wine is usually one of cocktail parties and sparkling jewels. But if you're not a connoisseur, you might have a difficult time choosing a wine to suit your rich tastes. PalmOS users can try Amy Reiley's Pocket Vineyard by NeoHand.

Pocket Vineyard provides an interactive Vintage Chart, a glossary of 400-plus wine terms, the Food Pairing companion, and My Tasting Notes—a personal database. Before you know it, you'll be a professional!

The interactive Vintage Chart allows you to specify a wine's country, region, type, and year, and find out whether it's worth drinking. The Vintage Chart covers the U.S., Australia, Austria, Chile, France, Germany, Italy, New Zealand, Portugal,

South Africa, and Spain, including specific regions, such as Tuscany, Bordeaux, and Western Australia.

The Food Pairing companion consists of a database of dishes and suggests several wines to complement the meal being served. In addition to

poultry and meats, it also recommends wines to accompany various desserts, cheeses, and even fast food. You can beam information from the My Tasting Notes database to other PalmOS-based organizers running Pocket Vineyard.

Pocket Vineyard works with any PalmOS-based organizer running PalmOS 3.0 or higher. It can be downloaded from the NeoHand Web site at a cost of \$19.95.

NeoHand; (773) 529-4403; www.neo-hand.com.



ACCESS ON THE GO

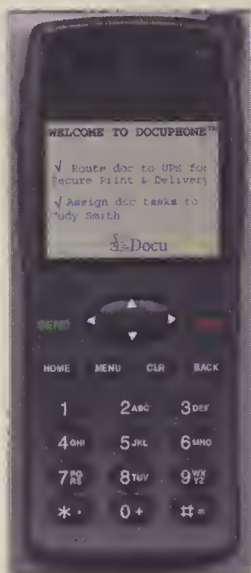
Collaboration is a great idea, but if you're in charge, and you're on the road, it can get difficult. DocuTouch is an online service that allows you to administer documents from anywhere. Now, DocuTouch has released DocuPhone, a WAP-based protocol that lets you do it all with your WAP-enabled phone.

The DocuTouch platform authorizes designated users to view and approve electronic documents and contracts securely over the Internet. Once a document is uploaded and registered in the DocuTouch system, privileges and tasks are assigned to specified users. Document owners manage the right to specific documents.

You can access document lists on the DocuTouch Web site, assign viewing, revising, and digital signing tasks, and route documents to a bonded UPS Document Exchange facility until 10:30 p.m. (EST), which is a six-hour extension of the usual delivery deadline.

DocuPhone is a free application.

DocuTouch Corp.; www.docutouch.com.



WHEN YOU GOTTA GO

It's great visiting a big city like New York. You can spend the days gazing at skyscrapers, shopping in famous department stores, or munching on hot pretzels from a sidewalk vendor. But, what happens when it's tinkle time? It's not easy to find a public restroom that's clean and safe.

For Palm users, YadaYada's Bathroom Finder may offer some relief. Created by wireless portal Rovenet with the help of besttoilets.com, Bathroom Finder offers YadaYada subscribers a wireless guide to public restrooms in 12 cities, including Atlanta, Boston, Chicago,

Denver, Los Angeles, Miami, New York, Philadelphia, San Francisco, Seattle, Toronto, and Washington D.C.

Simply select "Toilets" from YadaYada's Wireless Web Guide and you'll get instant access to a directory of public restrooms, including addresses and in-depth reviews of each facility, based on accessibility, cleanliness, and added amenities.

Bathroom Finder is free to YadaYada subscribers. The full YadaYada wireless Web ISP/portal service costs \$39 per month.

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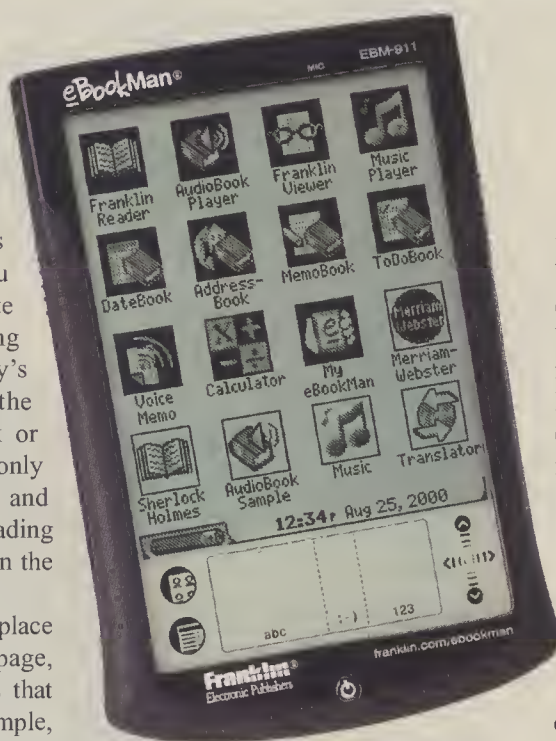
“Words, words, words.” From Shakespeare to Stephen King, Copernicus to Churchill, the world of literature, science, and history can be found online and in the palm of your hand.

by Jen Edwards

It was the best of times, it was the worst of times....”

Reading just a bit of Charles Dickens is enough to make you want to curl up in your favorite chair with a book and a steaming mug of hot chocolate. But today’s technology has advanced to the point that the standard paperback or hardback book is no longer your only choice. Electronic books are here, and can provide just as enjoyable a reading experience as one in which you turn the pages.

Perhaps nothing can ever truly replace the written word on the printed page, but e-books offer some advantages that their paper cousins cannot. For example, electronic books do not take up any additional space in an already crowded briefcase, assuming that you already carry a laptop or PDA. They add much less weight than a hardcover tome. They can be easily and quickly updated, so that the most current information is always at hand. There has also been some experimentation in recent years with



The Franklin eBookMan may look like a PDA, but this dedicated reader contains a number of special features, such as a high-resolution display, just for reading e-books.

electronic textbooks for law students, so that they can add relevant portions of their texts to the notes they take in class.

But e-books are for fiction as much as nonfiction. Not only is there a wide variety of reference materials available, but there is a growing market for entertainment and fiction materials. Want to read the latest work-in-progress novel from Stephen King, *The Plant*? It is available only in e-book format (www.stephenking.com), and is the first widely publicized experimental use of the Internet to replace paper books.

At press time, King had stopped working on *The Plant*, but he assured his readers that the story was merely on hold while he fulfilled other commitments, and not altogether cancelled. Approximately 46 percent of the people who downloaded the story actually paid for it, which was below King’s minimum threshold of 50 percent reader payment. Even more interesting, King says that he expects *The Plant* to eventually gross \$600,000 to \$1 million, not bad for a book that technically has never seen print, existing only in electronic form.

Perhaps you would like to read one of Shakespeare's plays, and don't want to lug around a copy of the *Complete Works*. All of his works are freely available on the Internet, along with hundreds of other classic titles.

Even big-name publishers such as Random House are getting into the electronic publishing game, so don't fear that you'll find nothing but a few dusty old titles available in the new electronic formats. Would you like to read the latest edition of *The Wall Street Journal* or *Fast Company*, without having to wait a few weeks for a print subscription to kick in? It's possible right now, thanks to e-books.

The choice of material is vast. The choice of formats is less so, though there are several. No standard has been reached yet for e-book-reader software. Adobe Acrobat has long been the *de facto* standard for online publications and software reference manuals. The Acrobat Reader is a freeware application for PCs and Macs that allows you to read documents in Adobe's PDF format. The advantages include high market saturation, ease of use, and the ability to see documents exactly as they were originally created, with columns, headings, and graphics.

The new kid on the block is Microsoft Reader. It provides more secure copy-protection technology, which appeals to mainline publishers just getting started in electronic publishing. It also is the only reader with ClearType technology, which is designed to create the best onscreen reading experience available. Only time will tell if both formats will continue to be widespread in the world of electronic publishing, or whether one will emerge as a clear standard.

The Right Tool for the Job

The first decision to be made when starting to explore the world of electronic books is which hardware device you will use. There are several options from which to choose, ranging from

your existing computer or PDA to a dedicated device such as the Franklin eBookMan.

The quickest way to get started on a desktop or laptop computer is to download the appropriate software. Since e-books are available in such a wide array of formats, it makes sense to get a variety of readers. That way, when you find a book online you would like to read, you will be able to download it without having to worry about locating the appropriate reader software.

Both Adobe Acrobat and Microsoft Reader, mentioned above, are must-have applications for the electronic reader's arsenal. If you would like to be able to listen to audio books on your computer, get the free Audible player from Audible.com (www.audible.com). Once the proper software is installed, it's very simple to browse the Web to locate and download the reading material that most interests you.

It's also possible to read electronic books using a Palm organizer or a Pocket PC handheld. Again, it is a matter of getting the right software in order to access electronic documents. Most Pocket PCs come with the Microsoft Reader preinstalled or on the CD that came with the device. Currently, Microsoft Reader is the only option available for the Pocket PC user, though it seems likely that addi-

tional software choices will be developed as the platform expands.

One such new product was recently announced—AportisDoc Mobile for Windows-Powered Handhelds (Pocket PC). When released, this software package will allow Pocket PC users to access the thousands of titles already available for PalmOS handhelds on the Aportis Web site. A 60-day free trial is available, after which the software sells for \$30.

There are quite a few more options available for the PalmOS, which will work with Palm organizers, the Handspring Visor, IBM's WorkPad, Sony's CLIE, and the TRGPro. Since there are several different formats for Palm documents, it pays to make sure that you have the right software to handle as many as possible.

The most commonly used format is Palm DOC, the original standard for

cool cases for cool toys from handhelds to laptops



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Books from popular authors like Stephen King and Patricia Cornwell are a download away, but the RCA REB1100 has less available content than other dedicated readers.

Palm documents (not to be confused with Microsoft Word .doc files on your PC). Other common formats include HTML, iSilo, and TomeRaider. Several Palm applications are capable of reading electronic books; some of the more popular ones are as follows:

AportisDoc, the original Palm DOC reader, is one of the easiest to use.

iSilo provides higher compression in its native iSilo format, as well as support for HTML, standard Palm DOC files, and embedded graphics. It includes a freeware PC conversion utility that will automatically convert Web pages for viewing on your Palm handheld.

TomeRaider has its advanced indexing and search capabilities that make it ideal for large reference works, such as dictionaries.

Qvadis includes a teleprompter-like autoscroll feature and a superb PC conversion/viewer utility for Palm DOC files.

Documents To Go from DataViz is capable of reading and editing Microsoft Word documents directly on a

PalmOS handheld.

The lines between the various handheld formats have been slightly blurred by the release of the AportisDoc PDF Converter, which allows handheld users to extract the text out of an Acrobat PDF document and convert it so it can be read on the handheld device. Since there are several conversion utilities available that allow users to convert simple text files into the DOC, iSilo, and TomeRaider formats, it is now more or less up to the reader.

Only time will tell if there will be a Palm reader or conversion program that will allow PalmOS handheld users to read books in the Microsoft Reader format. While most books are available in both formats, some books are

published in either one or the other due to exclusive contracts. It would be a shame if the brave new world of e-books were stunted by a myriad of closed formats—the more open the platform, the easier it is for everyone to get involved.

Dedicated Hardware

Franklin's eBookMan, which provides a completely new option for reading electronic books, will likely be shipping by the time you read this. This device is a dedicated reader that provides a few personal information management applications as a bonus, instead of the other way around as with a standard PDA equipped with e-book software.

At first glance, the eBookMan bears a striking resemblance to an iPAQ Pocket PC or a Palm V. The major difference, though, is that the front of the eBookMan is almost entirely taken up by the screen—there are no application or scroll buttons. Display resolution is 200 x 240, enabling the user to view more words

onscreen than with comparable devices. Initially, it will be available with either 8MB or 16MB of built-in RAM, and all models will include a MultiMedia Card (MMC) slot for virtually limitless expansion.

Other features include a USB cradle or cable for PC synchronization, and a version of Intellisync that provides a synchronization link to Microsoft Outlook. The device also supports MP3 downloads and playback.

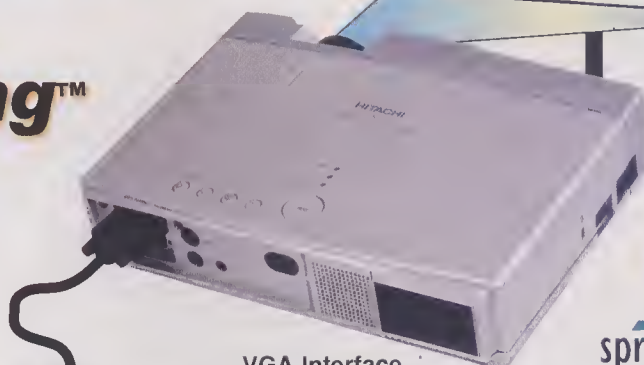
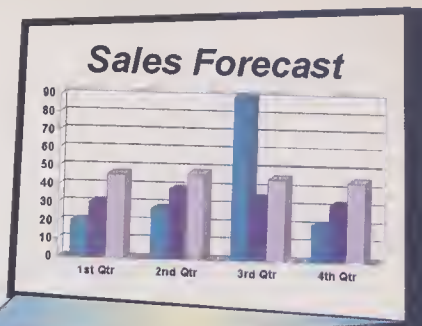
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Many titles are available online at www.franklin.com/ebookman, with many more to come. These include several dictionaries and Bible translations, speaking language translators, *The Physician's Desk Reference Guide to Prescription Drugs*, *Parker's Wine Guide*, and *Bartlett's Familiar Quotations*. Additional titles can be found at audible.com.

The Franklin eBookMan is a very exciting device that will likely have a substantial impact on the electronic publishing industry. Unlike previous dedicated devices, such as the Rocket Reader, which were relatively large and bulky, the Franklin eBookMan is as small as a Palm or Pocket PC and can easily be slipped into a pocket, briefcase, or purse. It includes the best features of both—the larger screen enhances the reading experience by putting more words on the "page," and the increased RAM and the MMC slot guarantee that you can keep plenty of reading material with you.

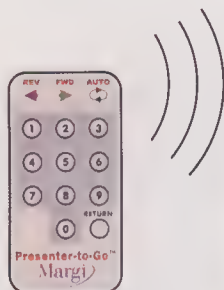
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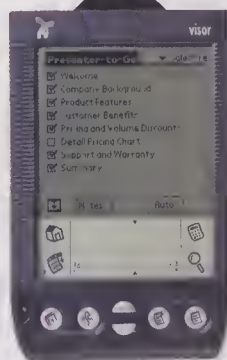


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and the ability to read electronic books in the Microsoft Reader format, you can be assured of an ever-expanding library of titles.

The eBookMan isn't the only choice for a dedicated reading device. RCA recently released the REB1100 and the REB1200. The 1100 has a monochrome screen, weighs 19 ounces, and is about the size of a paperback book. It comes with an 8MB SmartMedia card and retails for \$299. The 1200, which retails for \$699, is about the size of a hardback book. It has an enhanced color screen and a faster modem than the 1100, and includes an 8MB CompactFlash card. The memory of both units can be upgraded with larger cards.

Downloading content for either device is as simple as plugging it into a phone jack, connecting to the GemStar site,

selecting the titles of interest, and waiting for the chosen e-books to be delivered straight to the device. While there is a good selection of some of the more popular authors, like Stephen King and Patricia Cornwell, there is not as broad a range available for the REB devices as there is for Palm/Pocket PC and the Franklin eBookMan.

Where To Find the Words

Now that you have the tools you need to read electronic books, where do you find them? The last year has seen an incredible boom in the types and amount of content available. Whether you want to read electronic books on your desktop PC, laptop, Palm/Pocket PC, or a dedicated device like the Franklin eBookMan, you will need to explore the

Internet and find some titles that are of interest to you. Quite a Web sites offer e-books for free.

Perhaps the largest collection of public domain electronic books can be found at Project Gutenberg, www.gutenberg.net. Literally thousands of books are available free of charge, from *Abraham Lincoln's First Inaugural Address* to *Zen and the Art of the Internet*. All of Shakespeare's plays are available there, as well as the works of Charles Dickens, Mark Twain, Homer, and Dante.

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sics, history, and great literature. Two other excellent sources for public-domain e-books are the digital library maintained by the University of Pennsylvania at digital.library.upenn.edu/books (which includes a superb selection of history and electronic reference texts) and the Christian Classics Ethereal Library at www.ccel.org (an excellent repository of religious books).

It is also possible to find smaller libraries of electronic books on the Internet by using a search engine, such as Yahoo! or Google, to search for particular books by author or title. This is particularly handy for students, as many of the older titles they are required to read are freely available on the Internet. Not only can that save some serious cash at the campus bookstore, but carrying a few books in a Palm handheld or laptop can lighten the load of a backpack.

If the text is not available online it may still be possible to access a study guide at a site such as SparkNotes (www.sparknotes.com), which is designed to offer electronic texts on a variety of educational topics. Even those famous yellow and black CliffsNotes have gotten into the electronic publishing arena, offering 290 titles at low prices for immediate download in Adobe Acrobat format at www.cliffs.com/index.html.

If a PalmOS handheld is your choice for a reading device, the first place you should look for electronic books is MemoWare, a repository of over 6,500 documents with about 100 more being added every week. The site is very easy to navigate, with reference categories such as business, engineering, law, math, medicine, philosophy, and sports. Literature categories include adventure, biography, horror, humor, mystery, poetry, sci-fi, and western.

Those topics don't adequately describe the breadth of MemoWare's offerings—where else can you get the complete *MASH* episode guide, a Pokemon reference, and the script for *Citizen Kane*? Several different formats are supported, such as Palm DOC, iSilo,

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***The Plant* is one of the latest works of fiction from popular writer Stephen King, but you can't buy it in a bookstore. This was the first widely publicized experiment in using the Internet to replace paper books.**

TomeRaider, as well as several of the more popular database formats (for the more complicated reference works). Extensive Help pages and the chance to contribute your own electronic texts make MemoWare an always up-to-date source of electronic reading material.

If you want to read more current material—the latest John Grisham novel, perhaps—you will need to check out one of the several fee-based Web sites. Most support both the Palm and Microsoft Reader formats, ensuring that you can enjoy their content no matter which device you might have. But while there are some bargains to be found, most e-books cost about the same as their paperback or hardcover counterparts. Two of the newest sites are Peanut Press (www.peanutpress.com) and FictionWise (www.fictionwise.com).

Peanut Press has a variety of titles, including *The Wall Street Journal*, an extensive collection of *Star Trek* titles, and an ever-expanding array of magazines like *Fast Company* and *Analog*. FictionWise specializes in short stories and has an innovative micropay system that allows you to deposit money in your account in increments of \$5.

You can then download stories, most of which cost just a dollar or two, until your balance has been depleted.

The Baen WebScript program (www.webscription.net/baen) is a little-known offering that's sure to appeal to science fiction and fantasy fans. Registration is free, and each month subscribers are notified of new titles being published in approximately three months in print versions. For just \$10 per month, you can get four to six full front-list novels before they are in print.

This service is available in both HTML and Palm formats. This is a very ambitious undertaking for a traditional print publisher. The thinking behind this clever plan is to encourage people to read more Baen books and get them interested enough to actually purchase the book once it is published, while rewarding loyal electronic readers with a sneak peak at upcoming titles.

Baen also maintains a library of free books online, in which their authors are encouraged (but not forced) to post the first book of a given series. The hope is that fans will be enticed to buy the rest of the series after reading the first novel. According to the publisher, the profit generated by the word of mouth publicity will completely overshadow any losses that might occur through online piracy.

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PARALLEL COMPUTING

The old adage, "Two heads are better than one," applies to computers, too. By configuring a network to function as a single system, computer scientists are achieving supercomputer speeds at a fraction of the cost.

by David Forman

We tend to think of a computer as having a single microprocessor. Perhaps this is due to an innate tendency to think of computers as analogous to ourselves. We have a single brain. Computers, therefore, have a single microprocessor.

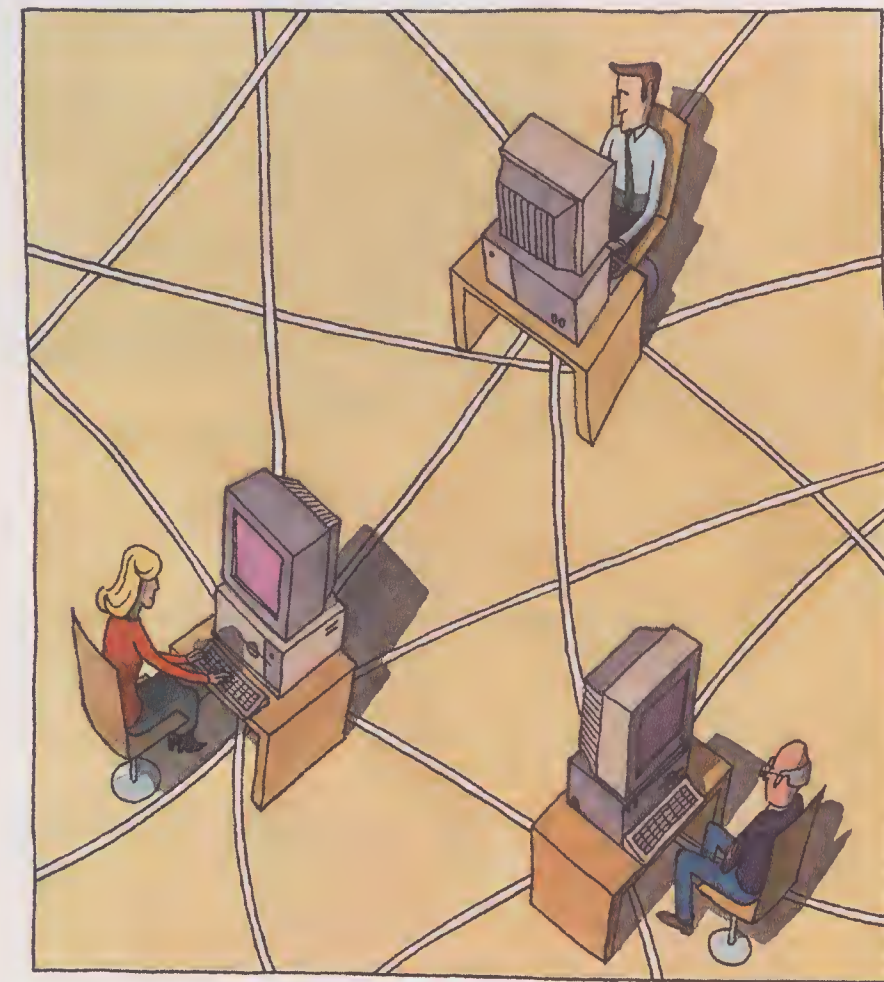
However, multiprocessor systems have long been used for servers and other intensive applications. Now, high-speed LAN architectures can turn a network into a supercomputer.

Parallel computing takes dozens, hundreds, or even thousands of microprocessors and configures them to work cooperatively on a single task. A parallel-computation machine can be built in a single large enclosure, or each processor can be housed in a traditional computer case that is networked together with other machines. A parallel-computation machine can even be comprised of computers spread across a wide area network, such as the Internet.

Such a machine can do things exponentially faster than a single microprocessor could. Each processor operates at its rated speed, but since each large task is broken down into smaller discrete tasks, many aspects of it can be done at once.

Ask a dozen computer scientists how to build a parallel-computation machine and you'll get a dozen different answers. Generally, how you build the machine depends on what you want to use it for. However, most will agree that it can be done entirely with off-the-shelf parts and public-domain software.

More research is taking place in the



area of parallel computing than ever before. Computer-science laboratories are investigating its possibilities. Government labs are using parallel-computation machines to address the massive number-crunching requirements of astronomy, meteorology, and other applications. Private industry is looking at parallel computing for massive database applications.

Parallel-Computing Basics

When considering the idea of parallel computing, a number of basic questions arise. For starters, why not use a faster microprocessor rather than parallel processors?

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Do It Yourself Parallel Computing

To learn more about Beowulfs, visit the Beowulf home page at www.beowulf-underground.org.

Want to build your own Beowulf? Hop over to www.beowulf-underground.org/documentation.html where you'll find detailed instructions.

Another set of step-by-step instructions is available at www.beowulf-underground.org/doc_project/howto/english/beowulf-howto-4.html.

If you want to buy a Beowulf system, you'll find a list of vendors at www.beowulf-underground.org/vendors.html.

To join Distributed.net, point your Web browser to www.distributed.net/howto.html, then hop over to www.distributed.net/download/clients.html to download the required software.

To join SETI@home, visit setiathome.ssl.berkeley.edu/download.html to download the appropriate software. □

machine using parallel processors.

Then why not just wait for the fastest processor to get even faster? The answer to this one is a bit more complicated. The speed of a microprocessor is not the only thing that determines the speed of a computer. For example, the speed of its memory can hold back the processor significantly. (That's why modern computers use cache memory—to counteract the latency that results from having memory that is slower than the processor.) A parallel-computing machine doesn't accomplish tasks faster. Rather, it accomplishes more little things at once. As a result, the overall task takes less time.

To make this clearer, let's take some simple examples. When you ask a PC to calculate two plus two, it does so in a fraction of a second. This is a relatively simple task for the computer to perform.

You won't get much of a performance improvement by asking a parallel-computing machine to process two plus two. This task is too simple to take advantage of the multiple processing capabilities of the machine.

Now, let's take a complex task like modeling weather patterns for the entire globe. In this case, there are many things going on at once. Storms are raging over one part of the planet. Earthquakes shake another part. Still others are shrouded in fog. In some places, the sun bursts through and heats up the land. It's incredibly complex. In a case like this, a parallel-computing machine yields tremendous benefits.

Let's take another example. Imagine that you're waiting in line to enter a subway

station. If there's only one turnstile, each person must wait in a single line. This is an example of a single-processor or serial system. Just as each person goes through the turnstile in line, each computer instruction is likewise processed in line, one after another.

A parallel system, by contrast, would have many different turnstiles. Instead of a single line, there would be many different lines. When there is a complex task to perform (such as many people entering the subway), the multiple processors (multiple turnstiles) have a profound effect on speeding things up. But when there is only a simple, single task to perform (if there is only one person who wants to board the train), the extra processors (or turnstiles) don't have any effect.

Not as Simple as It Seems

However, parallel computing is not as simple as letting people through turnstiles to enter a subway station. When people want to enter the station, it doesn't really matter in what order they do it. However, when computer instructions are processed, certain instructions must be performed before others. In fact, certain instructions need the results gained from other instructions before they can be performed.

Therefore, software must be written expressly for the parallel-computing environment. Software has traditionally been designed to run on computers with single processors. You can't just load conventional application software onto a parallel-computing machine and expect

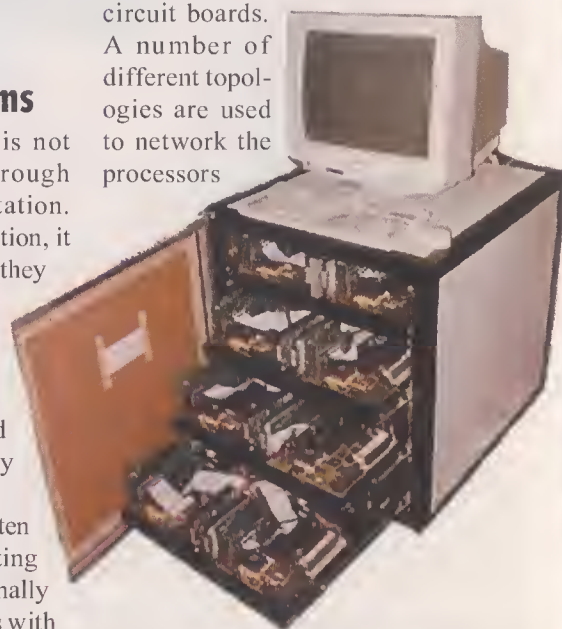
it to work. It has to be expressly designed for parallel computing.

In the world of computer science, this is known as developing parallel algorithms. An algorithm is a procedure or set of steps for solving a problem. Algorithms are the conceptual foundation of any computer program. However, the vast majority of algorithms are designed for single-processing environments. Naturally, the approaches to solving specific problems must be drastically altered to function in a multiprocessor environment.

In addition, the standards that are developed must allow parallel-computing software to be used independently of particular machines. To design and develop software that can be run only on a particular parallel configuration is pointless. The hardware will change constantly. Software has to be designed that is independent of particular configurations and that can be easily ported to other machines.

No Two Are the Same

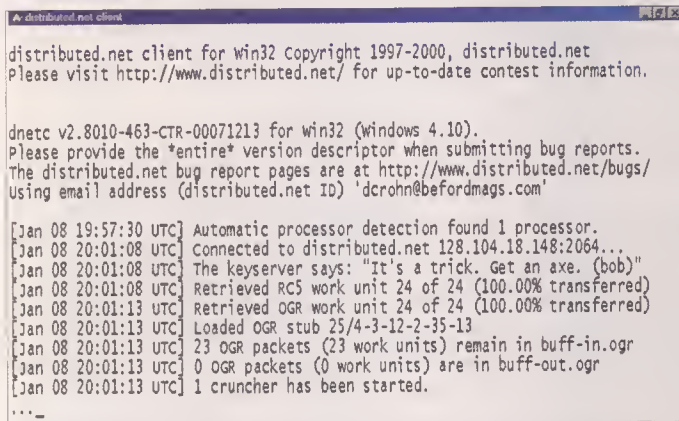
What does a parallel-computing machine look like? In fact, each system is unique. Some parallel-computing machines are built using discrete computers networked together. Others use rack systems with mounted circuit boards. A number of different topologies are used to network the processors



The original Beowulf cluster had just 16 individual computers, or nodes, and used 486-class processors and 10BaseT Ethernet.

together. In some cases, designers use multiple-processor computers (two or more processors per motherboard) networked together.

On the inside, there are also myriad variations. Different operating systems and control software can be used to produce a wide variety of systems. As you'll see in the examples below, there are many creative ways to make a parallel-computing system. You can even do it over the Internet, if you don't need things done in strict order or within strict time constraints.



```
distributed.net client
distributed.net client for Win32 Copyright 1997-2000, distributed.net
Please visit http://www.distributed.net/ for up-to-date contest information.

dnetc v2.8010-463-CTR-00071213 for Win32 (Windows 4.10).
Please provide the *entire* version descriptor when submitting bug reports.
The distributed.net bug report pages are at http://www.distributed.net/bugs/
using email address (distributed.net ID) 'dcrohn@befordmags.com'

[Jan 08 19:57:30 UTC] Automatic processor detection found 1 processor.
[Jan 08 20:01:08 UTC] Connected to distributed.net 128.104.18.148:2064...
[Jan 08 20:01:08 UTC] The keyserver says: "It's a trick. Get an axe. (bob)"
[Jan 08 20:01:08 UTC] Retrieved RCS work unit 24 of 24 (100.00% transferred)
[Jan 08 20:01:13 UTC] Retrieved OGR work unit 24 of 24 (100.00% transferred)
[Jan 08 20:01:13 UTC] Loaded OGR stub 25/4-3-12-2-35-13
[Jan 08 20:01:13 UTC] 23 OGR packets (23 work units) remain in buff-in.ogr
[Jan 08 20:01:13 UTC] 0 OGR packets (0 work units) are in buff-out.ogr
[Jan 08 20:01:13 UTC] 1 cruncher has been started.

...-
```

Distributed.net's client software connects your computer to one of the Distributed.net servers via the Internet, then assigns it a set of solutions to test.

Two features that almost all closely networked parallel-computing machines share are the Linux operating system and off-the-shelf hardware. One of the reasons parallel-computing machines are becoming popular is that they are comparatively inexpensive, since the components are the same as those being used in the majority of home and business PCs worldwide. In contrast, privately used supercomputers are commercially built to order, generally using expensive custom hardware.

For software, the Linux operating system offers a number of advantages. First, it was designed as a network operating system. Second, it is public domain software and it is available in many variations. This lets system builders buy a single copy (or even download a single copy) and create drive images with it for each computer in the network.

Those are the basics of parallel computing. Now, let's take a look at some

specific ways that parallel computing is being used in the world today.

Beowulf

One of the places that parallel computing began was with the Beowulf Project. This project began in 1994 as a NASA project for the Center of Excellence in Space Data and Information Sciences (CESDIS). Since that time, it has become a popular style for parallel computing. One of the developers of the technology has since founded the Scyld Computing

Corporation, which develops software for Beowulf-style computer clusters.

In a Beowulf system, a number of computers are linked together via Ethernet connection, and all operate on the same problem jointly, as if one computer. A Beowulf system is generally known as a Beowulf cluster.

The first Beowulf had just 16 nodes, or individual computers. The goal was to develop a system that used commodity hardware and open-source software. The original Beowulf used 486-class processors.

One of the interesting things about the original Beowulf is that it was limited to 10BaseT (10-Mbps) Ethernet rather than the 100BaseT (100-Mbps) Fast Ethernet that is so inexpensive and readily available today. In 1994, 10BaseT Ethernet was the only affordable option. However, that speed was not fast enough for the system.

In order to overcome the speed constraints, designers used multiple network interface cards (NICs) in each machine. By using special software, they were able to "channel bond" the multiple Ethernet connections into what the computers saw as a single connection.

Today, 100BaseT Fast Ethernet operating at 100 Mbps is ubiquitous and cheap, and channel bonding is not

generally required. However, it is possible to bond multiple 100-Mbps channels to increase the network speed of a parallel-computing machine. Furthermore, as we'll see with some other projects, channel bonding isn't the only thing you can do with multiple NICs.

It is much cheaper to build a Beowulf than to buy a traditional parallel-processing system. However, a Beowulf does suffer some drawbacks, most noticeably latency between the component systems. Programmers working with a Beowulf must cater to the network needs—balancing bandwidth much like a network administrator. A true parallel-processing computer (where the processors are connected on a bus, not through Ethernet) does not suffer the latency problems of a Beowulf.

There is an infinite number of differences between Beowulf style machines. One is whether the machines use shared memory or whether each machine has its own discrete memory. In many cases, both shared memory and not, programmers use a message-passing style of communication to best take advantage of the network. (www.beowulf-underground.org)

Distributed.net

At the other end of the parallel-computing spectrum is something called a Network of Workstations, or NOW. Unlike Beowulfs, NOWs aren't built using dedicated machines. Rather, they are built using computers located on general-purpose networks. Many networked computers lay idle all night long. Why not dedicate this free time to working with a virtual parallel-computing machine residing on the network?

Distributed.net is a good example of a NOW. There is no single room where Distributed.net is located. It is not a specific set of computers that is dedicated to certain tasks. Rather, Distributed.net is a collection of computers located on the Internet whose owners have offered to dedicate some time to Distributed.net's tasks.

As you can imagine, such a parallel-computing machine must be pretty flexible. Unlike a Beowulf, Distributed.net does not have a dedicated farm of machines

For More Information

A wealth of information about parallel computing is available on the Internet. Here are a few resources to help you in further research and reading.

The Center for Research on Parallel Computation at the National Science Foundation's Science and Technology Center has a FAQ at www.crpc.rice.edu/crpc/faq.html.

IEEE Computer Society's ParaScape has a listing of Parallel Computing sites at computer.org/parascope.

The SHRIMP Project at Princeton is another place where parallel-computing research is taking place. You can find it at www.cs.princeton.edu/shrimp.

Look into some of the many applications of parallel-computing research at the Center for Research on Parallel Computation's applications list at www.crpc.rice.edu/crpc/research/applications.html.

To learn more about Scyld Computing Corporation and its software for Beowulf-style computer clusters, visit www.scyld.com.

to work with. If a Beowulf is like a corporation with full-time employees, a NOW like Distributed.net is like a volunteer organization where people are only available some of the time.

Furthermore, while full-time employees are expert professionals in their jobs, volunteers are not. The same is true of Distributed.net. It must handle a wide variety of computer configurations, speeds, and components. Thus, the algorithms used for Distributed.net are extremely tolerant of machine capabilities, timing, and latency. Just like a volunteer organizer, Distributed.net understands that its members are unpaid volunteers.

That doesn't mean Distributed.net can't accomplish impressive feats. In fact, what it does is quite amazing. It cracks codes. The first code that Distributed.net cracked was RCS-56 encryption code. This was accomplished back in 1997.

Since then, the loosely organized virtual network of machines has cracked numerous other codes. It provides a useful service to the data-encryption and protection industry, which now has a public watchdog trying to crack its codes. In fact, prizes are awarded for cracking the codes first. Distributed.net has already won a few of them.

The way it works is straightforward. You download a piece of client software and run it on your machine. When the client software is running, it connects your computer to one of the

Distributed.net servers. Your computer is then assigned a set of solutions to test out. The faster your CPU, the faster it will finish testing the set, at which time it can begin another one. Obviously, the more computers working on this, the faster it goes.

The reason Distributed.net works across the Internet is that one computer's testing does not affect any others. The only point at which any processing time is wasted is the moment at which one of the computers finds the solution. (The others working simultaneously are effectively wasting their time.) In general, however, each computer can process prospective solutions in its own sweet time. It's a slow, laborious process. The only thing that helps is more computers!

To that end, any computer on the Internet can help. You don't need a fast Internet connection. The computer just has to be available. (And if your computer

finds the key to breaking one of the codes, you get a piece of the prize!)

When we checked the statistics of one ongoing Distributed.net project (RSA Labs' 64-bit RC5 Encryption Challenge), we found that Distributed.net had been working on the project for 1,155 days. Since the start of the project, 278,074 users had participated, 36,576 of which had been active the previous day. So far, the statistics showed, some 6,865,758,808,262,574,080 keys had been tested out of a possible 18,446,744,073,709,551,616 (2^{64})—37.2 percent of all possible keys. (www.distributed.net)

SETI@home

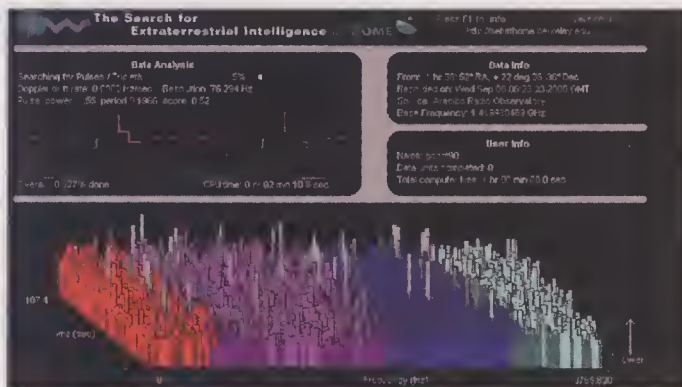
If you think trying to break encryption codes is cool, wait until you hear this. By joining the SETI (Search for Extraterrestrial Intelligence) project, SETI@home, you can participate in the search for intelligent life in the universe!

This parallel-computing project also dates back to 1994, and a Christmas party discussion about using people's home computers to analyze massive amounts of data.

Here's how it works. There's a huge radio telescope in northwestern Puerto Rico called the Arecibo Radio Telescope. It is used to listen to radio signals from outer space. These signals are located in a narrow range of spectrum, which produces less interference. SETI is looking for both intentional messages and unintentional "leakage" from outer space.

Remember the scene in the movie *Contact* where the scientists realize the signal they are receiving from outer space is footage from the 1936 Olympics in Germany? The 1936 Olympics was the first event ever to be broadcast on television, and the aliens in the movie intercepted the footage when it “leaked” off our planet. The movie *Contact* was based on the SETI project.

The problem is that the radio telescope is generating an enormous amount of data to



When their systems are not otherwise occupied, SETI@home participants donate their computers' resources to assist in the search for intelligent life in the universe. SETI estimates that its worldwide network of over 2,500,000 users operates faster than a supercomputer at a fraction of the cost.

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This KLAT2 cluster supercomputer used by the Aggregate employs AMD Athlon processors. These processors are particularly well suited to parallel computing because of their 3DNow! instruction set.

be analyzed. As the antenna searches the sky, a computer-based digital tape recorder records the radio signals it hears. These signals must be analyzed to look for anything out of the ordinary.

That's where the home computers come in. Like Distributed.net, SETI uses spare time on personal computers to analyze the data. To participate, you download a special piece of client software and load it onto your computer. Your computer will download a segment of data to work on and begin processing the data when you're not using the computer. SETI kicks in as your screen saver. When you come back to work, it turns off again.

When we checked in with SETI, there were 2,593,307 users that had donated 501,701.14 years of CPU time! The reward? Imagine being the person whose computer discovers the first radio transmission from extraterrestrial life? SETI estimates that its worldwide network operates faster than a supercomputer at a tiny fraction of the cost. (setiathome.ssl.berkeley.edu)

The Aggregate

Now that we've taken a look at some highly distributed systems that span the entire globe, let's return to closely

clustered parallel-computing machines. The Aggregate is the name taken by a collection of researchers for themselves and the technologies they use to improve parallel computing. One interesting and innovative system architecture they have devised is called the flat network neighborhood, designed to increase the speed of a parallel computing system while keeping it very inexpensive.

Although not committed to any one type of architecture, the Aggregate's use of the flat network neighborhood is an interesting example of innovation. One of the things that slows down traditional parallel-processing architectures is the network itself. As we saw with Beowulf, early incarnations required bonded channels to increase the network bandwidth.

Today, Fast Ethernet is widely available. But for those who want these faster network speeds, there is a cost—literally. The more nodes there are on the network, the higher the cost of the switch. The alternative to buying a switch with many ports is to network the computers in a tree form. Half the computers go to one switch, half to the other, and a third switch connects switches one and two. This works fine, except it slows things down.

The question for the Aggregate was how do you network a parallel-computing machine such that any machine could communicate with any other through a route spanning just a single switch?

The flat network neighborhood was the solution. By putting multiple NICs in each machine, redundant Ethernets are created whereby each machine can communicate with every other machine through a single switch. For the Aggregate, this created some novel routing problems (each machine required its own routing table) but

it increased network speeds while keeping costs down.

Another thing they discovered was that AMD's Athlon processor is particularly well suited to parallel computing because of its 3DNow! instruction set. The designers found that by writing code that took advantage of 3DNow!'s internal ability to execute parallel instructions, they could make their entire parallel-computing system about twice as fast. (www.aggregate.org)

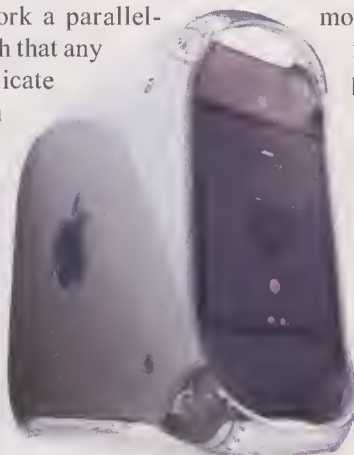
Wider Implications

Even in the home and workplace, we're starting to see parallel-computing machines. Apple recently made a splash by introducing a dual-processor system, and multiprocessor systems have long been back-office staples in the Wintel and UNIX worlds.

As computers grow ever faster, as more computers go online, and as the concepts underlying parallel computing become more widely known, you can expect these types of systems to play increasingly important roles. Imagine what's going to happen to tightly clustered systems and to highly distributed parallel-computing machines as each processor is upgraded to a faster speed. It's like increasing the productivity of every worker in a labor force. The whole enterprise

moves forward exponentially faster. Likewise, such parallel-computing machines will move forward ever faster.

Whether it's the analysis of vast amounts of research data, or the never-ending execution of calculations necessary to design a new space shuttle, it is likely that parallel-computing machines will play a role. It's exciting to see how parallel-computing technology is evolving, and to see more applications developed that can use this promising technique. □



Large networks aren't the only place where parallel computing is used. Apple's new dual-processor Power Mac G4 is bringing this powerful mode of computing into the home and office.

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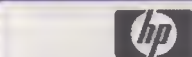
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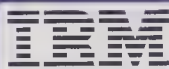
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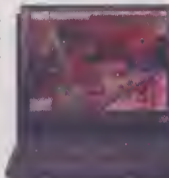
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Civilian Space Travel

During discussions last year about the fate of Russia's crippled Mir space station, one fleeting idea was to turn it into a Bed and Breakfast for civilian space tourists. Crazy? Maybe. But space tourism is a crazy idea that a lot of people are thinking seriously about.

Contrary to what you might think, civilian space tourism won't be aboard rockets and space shuttles. Rather, it is likely to happen on any one of a new generation of space planes.

The new space planes don't achieve orbit like the shuttle. They just nudge their noses into space far enough for tourists to see the curvature and glow of the earth and to experience weightlessness.

Sound like science fiction? Take a look at the facts as they are today. First, there's the X-Prize, a \$10-million pot that goes to the first team that can put three people into suborbital space on the same plane twice within two weeks. Check it out. The official Web site is www.xprize.com. There are already dozens of teams working to claim the prize. A slightly less ambitious prize (\$10,000) is the Bigelow prize (www.spacetransportation.org/bigelowprize.htm), an annual award given to the person or organization deemed to have done the most to promote the private, commercial use of outer space.

In the early days of terrestrial aviation, prizes spurred on entrepreneurs and



Someday, you may have a chance to see earth from a million miles away in a spacecraft like this one, the Cosmos Mariner designed by the Lone Star Space Access Corporation.

daredevils to go farther and faster. The prizes offered today aim to do the same with space, egging on private individuals who are frustrated with the slow advances of government efforts, and who believe private initiatives will be at the forefront of the next generation of space exploits.

The new designs are in many cases the result of combined government and private programs, with many companies founded by government researchers turning to

the private sector. To see for yourself, go online to www.spacefuture.com/vehicles/designs.shtml.

Already, adventure travel agencies are looking into civilian space flights, and some are even taking reservations. Space Adventures (www.spaceadventures.com) is accepting reservations for a suborbital flight to be available sometime in the next few years at a cost of \$98,000 a ride. Sound exorbitant? Not to the folks who have already signed up.

If you can't wait for the suborbital space flight, how about taking a ride in a MiG-25 fighter to the edge of space? It'll get you high enough to see the curvature of the earth. The cost is more reasonable, at \$12,595, but you'll have to arrange for your own transportation to the launch site in Russia.

To stay on top of advances in civilian space travel and other space topics, log on to Space.com (www.space.com) and Space Future (www.spacefuture.com), two sites dedicated to covering space exploration and industry.

If you're not convinced that civilians will be heading to space anytime soon, just look at history. Scientific barriers, once breached by government, have a way of being thoroughly overwhelmed once private sector elements start competing. Just look at the Pentium-class computer on your desk and remember that it has more power than the Cray supercomputer of yesteryear. □

Seeing Through Sound

To many technology aficionados, wearable computing is about getting business done on the run. Journalists, field scientists, and others working in difficult mobile environments will find that wearable computers provide solutions to some of their most pressing problems.

However, wearable computers can also help people overcome physical handicaps. For example, how about a wearable computer that provides an auditory map

of physical space so that blind people can "see" through what they hear?

That's precisely what has been developed at Philips Research Laboratories in Eindhoven, The Netherlands. It's a combination of hardware and software that scans the physical environment and creates a sound "map" that a blind person can hear. Dubbed The vOICe, the solution relies on the fact that human beings can reproduce a visual experience in their

brains as a result of aural stimuli.

The technology is rather complicated. A video camera mounted on the head takes pictures of the surrounding area. Based on what is in the picture, sound is created at different frequencies and degrees of loudness. A person trained to use The vOICe can then make a mental image of what is out there.

For example, a scene is scanned
(continued on page 135)

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TRADITIONAL TRAVEL AGENTS When the Web Is Not Enough

Having an insider on your team can give you an edge, but where do you find the right agent? Online, of course.

by David Forman

Road warriors are a self-assured lot. Out on their own, they have to solve problems themselves. Everything from subduing computer software glitches to overcoming passport problems to booking their own flights is all on them. To many, that's all part of the fun.

The Web has certainly made it easier. As long as you can get online, you can book your own travel through Expedia (www.expedia.com), Travelocity (www.travelocity.com), Lowestfare.com (www.lowestfare.com), and other online travel agencies. Special Web fares can save you lots of cash, too.

Yet, Web-based agencies aren't the be-all and end-all for booking travel. A living, breathing, flesh-and-bones professional travel agent can save you lots of time and money. A pro knows a few things you don't.

The travel agent business was one of the first to be brutally squeezed by the Web. It certainly seemed that a Web site could do anything an agent could. What does a travel agent have aside from a computer-based reservations system? If you can access that directly on the Web, who needs the agent? In fact, it could be you.

Just as independent bookstores were squeezed by bricks-and-mortar superstores and online wholesalers, travel agents have learned not just to survive, but to thrive, despite the encroachment of the online world. Agents can offer special deals and advice in ways that a Web site never could. When combined with a Web site, agencies can be even more useful.

To understand how a travel agent can help, you have to know a few basics

about how travel products and services are booked. Have you ever wondered how travel agencies (both traditional and online agencies) manage to have so much information at their fingertips? How do they get access to flights, hotel accommodations, and rental car companies? The secret is a GDS, or Global Distribution System.

There are four main GDS companies operating in the U.S.: SABRE (www.sabre.com), Apollo Galileo (www.galileo.com), Worldspan (www.worldspan.com), and Amadeus

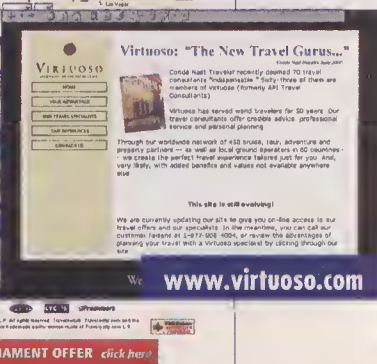
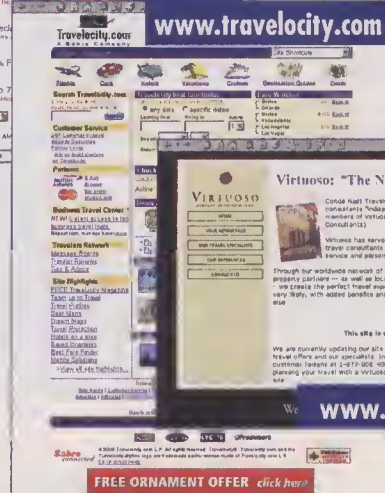
For the most part, the offerings of each GDS are very similar. However, certain systems periodically receive deals from one or another travel provider. This is why quoted fares may sometimes be different when purchasing through one provider or another.

You will find the same thing with agencies and agents. Most individual agencies have access to one GDS, and their airline offerings are usually determined by the rates available through that GDS.

The fact that consumers can go directly to the Web to purchase travel products has put enormous pressure on the travel agent business—so much so that it has had to reinvent itself. The result is better, more specialized service from the agents.

In sectors where human agents compete head-to-head with online agents, the difference can come down to expertise. Based on a conversation, a human being can tailor their suggestions to your individual

(www.amadeuslink.com). Each company has deals with major travel vendors to sell their services. As a result, each aggregates truly massive amounts of data about available travel products and services. Each GDS sells access to its database to travel agents and online travel merchants worldwide.



needs. A computer cannot. At least, not yet.

So before you abandon the idea of consulting a travel agent, consider finding a good one instead. By a "good" travel agent, we mean one who is well equipped to cater to your needs. Finding an agent who specializes in your type of travel or location, for example, can be a blessing.

Yet, if all you want to do is get the lowest fare from point A to point B, an online agency may be all you need. No human interaction required. But a specialist can make the difference when you're planning a two-week trip to Bangkok. When it's time for a vacation, a specialist can help turn a boring trip into a fun and exciting holiday.

How do you find a specialist? Try an agent consortium or franchise. For example, the Carlson Wagonlit franchise

(www.carlsontravel.com) can refer you to a trained specialist for a particular travel type or destination.

"We added a certified specialist component [to our Web site]," says Carlson Wagonlit Travel spokesperson Steve Loucks. "You pull up the specialization you want. Right now, we've got over 1,700 specialists in 40 categories, like Disney, cruises, or specific destinations like Australia. Unlike most sites out there that will list anyone as a specialist as long as they pay a fee, our site provides consumers with the peace of mind that they're dealing with a real-live expert instead of someone who is just saying they are an expert."

Carlson's agents are certified in their specialties by independent industry agencies, such as ASTA—the American Society of Travel Agents (www.astanet.com).

Franchise travel agencies aren't the only ones that specialize. Independents

specialize, too. One way to find them is through industry consortiums. Many independent agencies join together as consortiums, and sometimes co-ops, to increase buying leverage and pool resources. For some of the most respected specialists in the industry, check out the Virtuoso consortium (www.virtuoso.com).

In an emergency, a real-world agent can give you hands-on help that no Web site ever will. Once you're on the road, you may not be able to get on the Web to reschedule a flight. But a phone might be available.

Long term, if you travel a lot, it's a good idea to establish a relationship with an agent or agency that specializes in your needs. The agent can call you when deals are available that meet your needs, and be there to lend a hand if you're ever in a real bind. Don't expect that kind of service from a Web site. □

Broadband and Your Home Office

Broadband Internet connections are becoming increasingly popular. Today's choices include DSL, ISDN, cable modem, satellite, and fixed wireless, in addition to the already prevalent T1 and frame-relay technologies.

Road warriors can benefit a lot from a broadband connection in their home or satellite office. Everything you do over a modem, you can do much faster with a broadband connection. Web pages appear onscreen in an instant instead of half a minute. E-mail uploads and downloads more quickly. Real-time interactive Web applications are no longer constrained by the sluggish pace of your modem.

The "always on" aspect of many broadband connections makes it possible to host an intranet or small Web site at your office location. (We say "of many" because some broadband connections are not "always on" and instead use a logon procedure similar to that of modems—although much faster.) You can also host your own Virtual Private Network (VPN) and use it to access your files over the Web, wherever you go.

All broadband connections are not

alike. Services vary widely in technologies and contract provisions. When shopping for a broadband connection, look beyond the obvious. In addition to the provider's available bandwidth, be prepared to inquire about policies on IP addressing, upstream bandwidth, and LAN support.

One of the biggest differences between residential and business-class broadband connections—particularly with DSL—is the issue of static versus dynamic IP addressing. Since it is assumed that consumers download information more often than they upload, a dynamic IP address is commonly used. An IP address is the number that designates your computer's location on the Internet. In a dynamic scheme, this number changes every time you log on. In a static scheme, it is always the same.

It is difficult to host Web sites and other Internet information services with a dynamic IP address. A static IP address, however, can be matched with a domain name (yahoo.com, for example) for easy Web-site hosting. Business-class broadband accounts usually include static IP addressing, while consumer-class services generally do not.

Dynamic IP addresses are often allocated with a protocol called Dynamic Host Configuration Protocol or DHCP. Depending upon how it is configured, DHCP can change your IP address every day, every month, or hardly ever. If your business requires a static IP address, beware of vendors that offer a "virtually"



static IP address. If it's not truly static, you can't count on it always being the same, even if it remains so for long periods of time.

Another area in which business- and consumer-class broadband differ is upload speeds. Business-class broadband connections are generally synchronous, which means they offer the same speed for uploading and downloading data. Like traditional analog modems, consumer-class broadband solutions are usually asynchronous—they offer faster download than upload speeds. As mentioned

previously, the assumption is that home users download much more material than they upload.

Since Web browsing is currently the most popular home Internet activity, this assumption is generally correct, though probably not for long. Applications such as videoconferencing and peer-to-peer file sharing, which are increasingly popular, suffer from differing upload/download speeds. Any broadband solution, however, is superior to the 33.6-Kbps maximum upload speeds of a 56-Kbps analog modem.

Also, ask potential broadband providers about their network policies. Almost any broadband service can be connected to a LAN, but for it to get the benefits of a high-speed connection, the provider must support it. Some broadband providers specify a maximum number of computers that can be connected. Many contracts designed for small offices stipulate that technical support is available only if you have a single computer connected. Find out beforehand. Ask questions. Read the contract. Know what you're buying before you sign for it. □

Surviving the Dot-Com Fallout

Many laptop users long ago discovered the benefits of Web-based software. Over the last few years, Web entrepreneurs rolled out new services seemingly every week—contact managers, calendars, collaboration tools, and more. Most were free to users, as these new companies scrambled for subscribers.

Today, however, many of these companies are going belly up as venture capitalists tighten their purse strings. Our advice: Don't undermine your own mobile productivity by depending too much on these free Internet tools.

HotOffice.com, for example, was an impressive suite of online collaboration tools for creating an instant, Web-based, Virtual Private Network. However, it is going out of business. Existing customers are being referred to Intranets.com, a similar service.

Many frequent travelers have grown accustomed to using free Internet access services while on the road. AltaVista, however, recently shut down its free ISP service, as its provider, 1stUp.com, pulled the plug on its free dialup and DSL service and, according to the company's Web site, is "winding down the business." In some cases, acquisitions are coming to the rescue. Bluelight acquired Spinway. NetZero took over FreeInternet. However, in this environment, we are wary of depending upon such services.

Mobile Internet access is easily replaced—just sign up with a fee-based

ISP—but online software is not. Much has been written lately about the advantages of Application Service Providers (ASPs) and Web-based software. They offer instant updates (no CD-ROM installations required) and the ability to access your applications and files from any computer with an Internet connection.

However, traditional client software offers advantages, too. You can use traditional client

software without being connected to the Internet. Perhaps more importantly, when you use traditional client software, you can survive the demise of the vendor. When you use online software, you need your supplier to survive. □



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- Thousands of fun things to do on the Web
- One-click access to the Web
- The Internet is fun, and NetZero is the way to get on the Web
- No risk. You can keep your pay service and still have NetZero for free!

NetZero

Lost Luggage? Ask for Cash

When traveling, you don't have a lot of extra time. When traveling for business, time is especially tight. When an airline misplaces your luggage, it can undermine your whole trip. However, you don't have to simply accept this aggravation. Some airlines will compensate you for the cost of buying new clothes and necessities, but you might have to ask for it. So ask for it.

It doesn't have to take a long time, either. (It can, of course, take up plenty of time—but you can always give up if your request isn't going anywhere.) You'll be surprised to find that baggage agents have a wide degree of latitude when it comes to compensation.

A few tips: If you've just arrived back home, forget about it. You've got more clothes at home and can wait for your bag to be returned, or so the theory goes. If, however, you've just arrived in a strange city and can convince the agent that you're strapped, you just might get some cash.

The question is, how much? That depends on several factors, not all of which are in your control. The first is your status with the airline. If you're a frequent flyer or a club member, it will likely work in your favor. The second is your ticket class. It's likely you'll receive better treatment if you flew First Class. Unfortunately, neither of these factors is within your control when the flight is over and your luggage is missing.

Your attitude, however, is something you can control. Be convincing about your absolute need to immediately replace the lost items (at the bare minimum, you'll need to replace your toiletries). Explain why you cannot wait for the luggage to arrive (most lost luggage is eventually recovered). While it's fine to be firm, it pays to be nice about it, too.

Finally, remember that the baggage



agent is a human being doing his or her job. Every airline has its own policies about what baggage agents can and cannot do. The goal is to get the agent to give you the most that he or she is authorized to give. ■

SCIENCE & TECHNOLOGY *(continued from page 130)*



Using the brain's ability to produce a visual experience as a result of aural stimuli, The vOICe may allow blind people to "see" with their ears.

from left to right. Therefore, sounds heard at the beginning of a scan are to the left, while those at the end are to the right. Likewise, loudness is correlated to brightness. The louder the sound, the brighter the scene. For example, black is utterly silent whereas white is very loud. Everything in between is a different scale of gray. Similarly, pitch corresponds to the vertical alignment of an object pattern. The higher the pitch, the higher the pattern's vertical location in the visual scene.

These simple clues provide only the most basic parts of the picture. Against the backdrop of volume and

pitch, different shapes generate different sounds. If this seems like something that's difficult to master, it is. Peter B.L. Meijer, the creator of The vOICe, says it's like learning a new language.

Why The vOICe when artificial implants promise to use technology to give sight to the blind in the near future? The answer is cost. The vOICe has the potential to cost far less, without the associated risks of invasive surgery.

However such solutions are provided, the best part is that computer scientists, biomedical engineers, and other researchers are teaming up to provide solutions to some of life's oldest and most fundamental problems. In addition to giving sight to the blind, we're looking forward to seeing high-tech research improve artificial limbs and organs, too. To find out more about The vOICe, check it out online at www.seeingwithsound.com. ■

FREE INTERNET ACCESS: You Get What You Pay For

When Wall Street swung back to value stocks last year, free ISPs lost vital revenue as advertisers stopped seeking big-buck sales in penny-pinching markets. NetZero could become the last surviving free ISP—if, if, if.

by Timothy Captain

Getting online is the reason most of us buy PCs. Sure, you can use a PC to type letters, balance your checkbook, and play games, but you could do all those things without a computer. Without splitting hairs over Internet appliances, which are dumbed-down PCs, if you want to access the Internet, you need a computer.

For most people, the relationship between their PCs and Internet access is just like that between a television and cable or satellite programming. The device doesn't need the service to function, but it becomes vastly more useful when coupled with it. If you're going to buy a computer but not subscribe to an ISP, you might as well buy a brand-new car but never buy gasoline. In either case, you won't get very far.

Since 1998, however, when NetZero (NASDAQ: NZRO) opened its doors, there has been a way to skirt this rule. You still have to buy the PC, but the Internet access is free to use since it's paid by advertisers. This seemed like a great idea, and a basic model that had already been working successfully for online content providers, like Yahoo! (see "Remaking Yahoo!" on page 138) provide a highly demanded service free of charge to end-users, and the subsequent popularity of your service will attract advertising revenue. If it works for Web portals, why not for ISPs?

As the free services have found, there are a few good reasons why such a model



might not work for ISPs. First, the costs of running an ISP are much higher than those of maintaining a Web site. Web sites don't have to purchase and maintain banks of modems in hundreds of cities to provide the means for their visitors to reach them, nor do they have to create and distribute installation CD-ROMs or provide customer service.

Another reason why ISPs can't offer free services as easily as Web portals is that, no matter how popular they are, they attract a much lower number of visitors, so they can't generate the same advertising revenue. While Yahoo! can be reached by users of any ISP, NetZero can only present ad banners to those people who use it as their ISP.

But, if it's free, why doesn't everyone use it? If you're asking that, you've obviously never used a free ISP. The most unsettling trait of a free ISP is user tracking. If you don't read the licensing agreement carefully, you might miss this, but free ISPs track your online movements. They claim they don't track you individually, only by your demographic criteria, which you have to enter when you sign up, but even if that's the case, they have the ability to track your personal Web behavior at any time. Beyond that, if they aren't interested in tracking you as a person, why do they ask you to enter your name and street address when you sign up?

The other issues with using a free ISP are primarily about irritation. The activity window that pops up sporadically to ask if you want to stay online is perhaps the best example of this. If you want to download a song through Napster, for example, you'll have to sit there and watch the download because you never know when a message will pop up, giving you 30 seconds to click OK or be disconnected. Since the connection speeds offered by free ISPs tend to be painfully slow (largely because you're almost constantly downloading a new ad banner, or worse, one of those new commercials that appears in a window when you log on), you'll likely have to click quite a few of those OK buttons to download an entire MP3.

The most obvious drawback to using a free ISP is the persistent ad banner that

takes up roughly a 1.5-inch strip across the entire top or bottom of your screen. Actually, it takes up the entire length of the screen only if you set it as Docked. If you undock it, it takes up only about two-thirds of the length of the screen, but



One annoying feature that NetZero users must endure is being taken to NetZero's homepage every time they log onto the service. Another is the persistent ad banner at the top of the screen.

the banner floats above your other open applications, forcing you to constantly move it out of the way to see the program beneath it.

This banner is set at fixed pixel dimensions regardless of the free ISP; the larger the monitor and higher the display resolution you have, the less of an issue the banner becomes, because it takes up a smaller percentage of your screen. If you have a 15-inch monitor running an 800 x 600-pixel resolution, that ad banner is going to consume an inordinate portion of your display area.

This brings up another drawback to using a free ISP, particularly NetZero. Either by a software design flaw or a poor management decision, the services run well only on relatively new computers. While NetZero claims that the minimum

system requirements for running its software are a 90-MHz Pentium processor, 32MB of RAM, and an SVGA (800 x 600) monitor, its users will tell you that's not the case. If you don't have a 166-MHz processor with at least 64MB of RAM, expect poor performance when browsing the Web or doing anything else when you're connected to NetZero. If you don't have a monitor capable of offering XGA (1,024 x 768) resolution, don't expect to see much more than the ad banner.

Who, exactly, are free ISPs targeting with their services? Advertisers would like to see relatively wealthy members who have money to spend on the expensive products and services they're pushing. Common sense, however, indicates otherwise. Why would wealthy people subscribe to a free service when for \$20 a month they could have premium Internet access? Free ISPs are of the most interest to lower income users who can't easily afford to pay for Internet access or expensive new PCs.

It's not the end of the world for the free ISPs to have less affluent members. True, they won't attract as much advertising revenue, but lower income people still need to buy things. So why do free ISPs not target advertising to their audience? Instead of ads for online coupons and discounted products, NetZero, at last check, was running ads for Genuity (NASDAQ:GENU), an e-business hosting and management company serving enterprise-class corporations. How many Fortune 500 CEOs does NetZero (or Genuity) think are using its service?

After running their ads on the free ISP's services and analyzing their results, many companies catering to high-income clients are finding that free ISPs aren't reaching their desired audience. As a result, they're pulling their ad dollars and looking to send their messages through more appropriate mediums.

While technology startups had little problem losing millions of dollars waiting for their business plans to straighten out in 1999, 2000 brought some common sense to the tech sector. Although Wall Street has certainly thrown out the baby with the bathwater

over the past year when it's come to selling off stock in tech firms with solid business strategies along with the firms whose plans were ill-conceived, investors have shown they're not willing to throw money away on business plans that don't have a reasonable time frame for achieving profitability.

One of the biggest casualties of that shift was the free ISP industry. NetZero has survived, as has Juno, but not without sacrifice. On January 1, NetZero cut the number of hours members can use its service each month from unlimited to 40, while Juno is increasingly pushing its fee-based Internet service, which offers a number of amenities over its free offering, like ad-free Web browsing.

Hardest hit were WorldSpy, a free ISP that made a name for itself by not including ad banners in its service; 1stUp, a CMGi (NASDAQ:CMGI) company that provided the back-end services for such free ISPs as AltaVista (another CMGi company) and Lycos; and Spinway, which provided the back-end services for Kmart's (NYSE:KM)

BlueLight.com, Barnes & Noble's (NYSE:BKS) bn.com (NASDAQ:BNBN), and NBCi.com (NASDAQ:NBCI), among others.

Much of Spinway's assets were purchased by BlueLight.com in order to allow the e-tailer to retain its members through Christmas after Spinway ceased operations on December 1.

WorldSpy and IstUp fared worse, with no one offering to buy their pieces. After WorldSpy, an e-tailer attempting to pay for its free service exclusively with the increased sales dollars it assumed it would make from its members, closed shop last summer, the best it could do was arrange to receive a commission for every member it referred to Juno's free service.

1stUp's partners had to fend for themselves. AltaVista, for example, reached a referral agreement with Microsoft's (NASDAQ:MSFT) MSN Internet service, while Lycos made arrangements to refer its members to PeoplePC (NASDAQ:PEOP).

Does this mean that the free ISP model is dead? Not at all. According

to Jupiter Research, 8 percent of all Net users access the Internet primarily through a free ISP, a figure expected to increase to 13 percent in the next two years. With such a large audience, a dominant ISP (think the America Online of the free ISPs) could command huge advertising fees. If you knew your advertisement could potentially be seen by millions of people each week, you'd be willing to pay a premium for that exposure.

NetZero appears to be the last company to remain interested in providing free Internet access. BlueLight will likely scale back its free service over the coming months, while Juno continues to push its traditional fee-based Internet service. If NetZero can make its software less hardware-demanding, find advertisers that are looking to reach the types of people who use its service, provide a little more privacy and convenience to its users, and continue to show those entertaining TV commercials, it very well might be able to corner a profitable market for itself by “giving it away.” □

Remaking Yahoo!

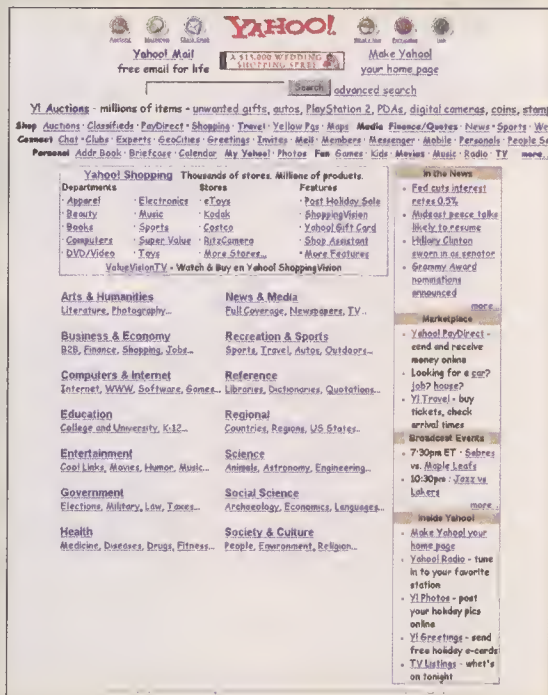
Yahoo! (NASDAQ:YHOO) became a very popular destination when it started back in 1994 because it was the only real portal in town, combining a usable search engine with an organized hierarchy of subjects and links. Whether you knew exactly what you were searching for or only had a general idea of the topic, Yahoo! (which allegedly stands for Yet Another Hierarchical Official Oracle, although cofounder Jerry Yang insists it was named that because it was founded by a bunch of yahoos), was the place to go.

Just a year later, as Yahoo! attracted more and more visitors, its creators, Jerry Yang and David Filo, had to move the site from their small computers at Stanford University to the large mainframes at Netscape in order to handle the increased traffic.

The site's attractiveness to visitors, in

turn, made it equally attractive to advertisers. With thousands and then millions of people stopping at Yahoo!'s pages each day, advertisers wanted those visitors to see their ads on those pages. While people are seldom thrilled about advertisements, it's a small price to pay for being able to use Yahoo!'s services free of charge.

Providing all of its services at no cost to the end-user made Yahoo! a very popular destination, and as such, made its advertising space even more valuable. This was a terrific situation for Yahoo!'s visitors, who had free access to massive amounts of high-quality information; for its advertisers, who could reach



Biggest Technology IPO Movers of Q3 2000

Ten Biggest First-Day Jumps

COMPANY NAME	NASDAQ SYMBOL	IPO DATE	OFFER PRICE	CLOSING PRICE	PERCENT CHANGE
Avici Systems Inc.	AVCI	7/28	\$31.00	\$96.75	212
Active Power, Inc.	ACPW	8/08	17.00	52.75	210
McDATA Corp.	MCDT	8/09	28.00	85.56	206
INRANGE Technologies Corp.	INRG	9/22	16.00	46.25	189
SpeechWorks International, Inc.	SPWX	8/01	20.00	56.75	184
CoSine Communications, Inc.	COSN	9/26	23.00	63.06	174
Blue Martini Software, Inc.	BLUE	7/25	20.00	54.78	174
Sunrise Telecom, Inc.	SRTI	7/13	15.00	40.31	169
OmniVision Technologies, Inc.	OVTI	7/14	13.00	34.00	162
Tritan Network Systems, Inc.	TNSI	7/13	15.00	38.44	156

Ten Biggest First-Day Drops

COMPANY NAME	NASDAQ SYMBOL	IPO DATE	OFFER PRICE	CLOSING PRICE	PERCENT CHANGE
iAsiaWorks, Inc.	IAWK	8/03	\$13.00	\$ 9.50	-27
INTERLAND, Inc.	ILND	7/25	12.00	8.94	-26
Avistar Communications Corp.	AVSR	8/17	12.00	9.38	-22
@Raad, Inc.	ARDI	9/29	9.00	7.19	-20
Lontranix, Inc.	LTRX	8/04	10.00	8.00	-20
Heed N.V.	HED (NYSE)	9/29	10.00	8.00	-20
Camtek Ltd.	CAMT	7/28	7.00	6.00	-14
ScreamingMedia, Inc.	SCRM	8/03	12.00	10.50	-12
Simple Technology, Inc.	STEC	9/29	11.00	9.69	-12
PeoplePC, Inc.	PEOP	8/16	10.00	8.88	-11

Source: Hoover's Online

millions of prospective customers; and especially for Yahoo! itself, which would receive more advertising revenue as it became more popular and then become more popular as it made the site better with the money received from its increased advertising revenue. It seemed like a situation that could only get better, and it did.

Until It Began To Fall Apart.

The majority of Yahoo!'s advertising sales came from other dot-coms, but unlike Yahoo!, most of them hadn't put much thought into their business models. Many e-tailers, which had spent months undercutting one another on price, didn't have the resources to fund exhaustive advertising campaigns, while others went out of business entirely. As those advertising dollars began to dry

up, so did Yahoo!'s revenues.

Unlike a magazine, which has a cover price that helps support its ad revenue base, Yahoo! charges nothing for its content, leaving advertising as its single primary revenue generator, one that's now diminishing quickly. With advertising representing about 90 percent of Yahoo!'s revenue, the company needs to do something to insulate itself from the dot-bomb effect. Investors have noticed Yahoo!'s dire straits, devaluing its stock price 87 percent in 2000, bringing what was a \$132-billion company on the first day of 2000 to a \$17-billion one on the last day.

Yahoo! isn't planning to lay down and die, though. Instead, it's going to change parts of its business model. While the large majority of Yahoo!'s content will still be available for free, it will soon develop new content that will only be accessible for a fee, following the model it

uses for some of its newer content, such as Bill Pay and premium e-mail services. An online music service is expected to be the first in Yahoo!'s upcoming line of fee-based content.

Loyal Yahoo! visitors don't have to worry about these changes, though. Jerry Yang insists that none of the content available for free now will be converted to fee-based services. Only select new services will require a paid subscription. However, at press time, Yahoo! announced that the site will begin charging for auctions, which had been a free service. Although it will likely strike many visitors as elitist that there will be areas of Yahoo! with restricted access, such subscription-based services are necessary to ensure that Yahoo! can continue to provide the rest of its services at the level to which we've all become accustomed. ■

NOTEBOOK REVIEWS

Mobile Graphics Accelerators

Many laptop buyers don't really know the difference between a Pentium III, a Celeron, and a K6-2 processor, but prefer the Pentium III for two reasons: Intel markets it heavily, and it offers the highest clock speeds. Even if you didn't know that a PIII was more powerful than a Celeron from name alone, you'd be able to mark an 850-MHz Pentium III as better than a 600-MHz Celeron.

Unfortunately, with video chipsets, especially mobile ones, there isn't any clear way to differentiate between them. In the absence of marketing and megahertz, most laptop shoppers rely on the amount of memory a video adapter offers to compare different chipsets. This isn't much more useful than comparing two PCs based only on the amount of system memory they offer.

Since video adapters, also called graphics accelerators, don't clearly state their clock speeds or, better yet, the number of polygons per second they can generate, here's a simple guide to the relative performance of the graphics accelerators available in laptops.

There are five major players in the laptop video adapter market today: ATI, NeoMagic, S3, SMI, and Trident. A sixth vendor, NVIDIA, is about to enter the fray. The offerings from SMI and Trident are simple chips used in value-priced systems. If you'll be using a laptop for spreadsheets, word processing, Web browsing,

and the like, you'll probably never notice the difference between one of their offerings and a more sophisticated video adapter. If you're interested in playing 3D games or watching DVD movies, though, you'll need more.

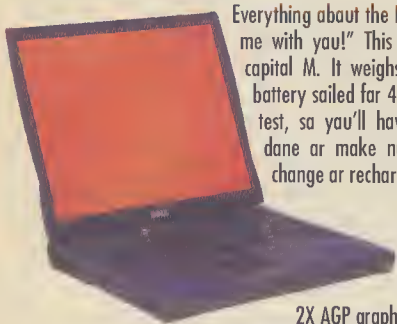
NeoMagic's line of mobile video adapters doesn't offer great performance, but it does offer extreme portability. By combining a video adapter and an audio adapter in one chipset, NeoMagic's solution takes up less space within a notebook chassis and consumes less power than separate video and audio adapters. Because of this, NeoMagic's chips are found in slim and light laptops, especially those from Dell.

At the high end are ATI and S3. ATI had occupied the top mobile performance solution with its RAGE LT PRO chipset, but topped that with the RAGE MOBILITY-M and -P, and then with the RAGE MOBILITY 128. S3 offers the Savage MX and IX, each of which offers performance that falls between the MOBILITY 128 and the MOBILITY-M/-P.

ATI's performance lead looks to fall this year, though, when NVIDIA enters the laptop video chipset market with its GeForce2Go, the mobile version of its GeForce2 MX desktop graphics accelerator. Having seen a prerelease demonstration of the chipset's capabilities, we can't wait until it becomes available in performance notebooks.



Dell Inspiron 4000



Everything about the Dell Inspiron 4000 screams, "Take me with you!" This notebook offers mobility with a capital M. It weighs just 5.6 pounds, and its Li-Ion battery sailed for 4 hours 20 minutes in our rundown test, so you'll have plenty of power to get work done or make numerous presentations without a change or recharge.

There's power aplenty inside, with an 800-MHz Intel Mobile Pentium III processor, 128MB of RAM, and ATI's RAGE MOBILITY 128 2X AGP graphics accelerator with 8MB of SDRAM and hardware DVD acceleration and motion compensation.

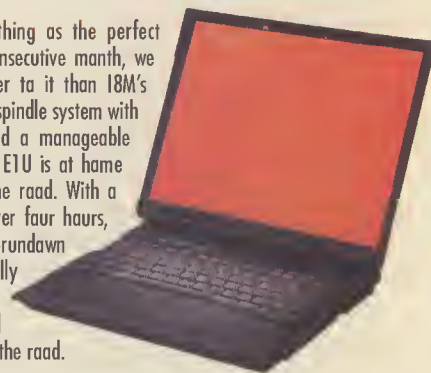
Note that this is a two-spindle system. The drive complement includes a 20GB hard drive, 8X DVD-ROM drive, and the old standby 1.44MB floppy drive. The DVD and floppy share a modular bay.

When you're not traveling, the Inspiron 4000 should serve well as a desktop replacement, despite its two-spindle design. It has a sharp 14.1-inch screen, the excellent graphics support, and a very good waveable-audio chipset in the ESS Maestra-2E. There's a docking station port for the optional Advanced Port Replicator if you wish to add that hardware.

Software includes the Windows Me operating system and, for those with no software, MS Works Suite 2001 and Money 2001.

The \$2,298 price tag includes a one-year parts and labor warranty and lifetime toll-free 24/7 tech support.

IBM ThinkPad A21m E1U



There may not be such a thing as the perfect laptop, but for the second consecutive month, we haven't found anything closer to it than IBM's ThinkPad A21m E1U. A three-spindle system with maneuverable dimensions and a manageable 6.7-pound weight, the A21m E1U is at home either on your desk or on the road. With a remarkable battery life of over four hours, as measured in our battery-rundown test, road warriors will especially appreciate this laptop. The internal 56-Kbps modem will help travelers get online from the road.

Travelers and desktop users alike will enjoy the peppy 700-MHz Pentium III processor, 10GB hard disk, and 8X DVD-ROM drive. Watching DVD movies is a pleasure, thanks to the crisp 14.1-inch screen and ATI RAGE MOBILITY-M video adapter, which provides DVD motion compensation to help movies play very smoothly.

Despite the system's low \$2,049 price, it offers a few more amenities that even more expensive laptops lack, like office applications. Included with the system is a copy of Lotus SmartSuite Millennium and PC Doctor.

If you're not already sold on the ThinkPad A21m E1U, you should be after you see the warranty, which features a full three years of parts and labor coverage with toll-free technical support available 24 hours a day, 7 days a week, for as long as you own the system.

Acentia Admira NSV

\$1,725

Acentia, Inc.

1240 N. Van Buren St., #211, Anaheim, CA 92807; (888) 838-8879; www.acentia.com

Sales Channel: Direct

CPU: 600-MHz Intel Pentium III

RAM/Expandable to: 64MB SDRAM/192MB

Drives: 10GB 5,400-rpm ATA/33 hard drive, 1.44MB floppy drive, 24X CD-ROM drive; one-spindle design

Video: 12.1-inch XGA active-matrix display; ATI RAGE MOBILITY-M 2X AGP video with 4MB of SGRAM

Audio: Crystal audio, integrated stereo speakers and microphone

Input: B3-key Windows keyboard, touchpad

Software: Windows Me

PC Card Slots: One Type II, CardBus and Zamed Video enabled

Communications: 56-Kbps internal fax modem, 10/100BaseT internal Ethernet adapter

Ports: VGA, line-out, Dolby Digital-out, mic, FIR, four USB, IEEE-1394

Size/Weight: 10.5 x 8.5 x .9 inches/3.4 pounds with battery installed

Battery/Battery Life: 1,500-mAh Li-Ion/1 hour 18 minutes achieved with power management disabled



Service and Support: One-year parts and labor warranty, 24/7 toll-free tech support

Options: 700-MHz Pentium III (\$150), 750-MHz Pentium III (\$400), 64MB RAM (\$85), 128MB RAM (\$150), 20GB hard disk (\$150), BX DVD-ROM drive (\$200), second Li-Ion battery (\$275), Microsoft Office 2000 Professional (\$225), Microsoft Office 2000 SBE (\$195)

Norton SI32 Score: 297.4

Acentia is rapidly gaining a reputation for its very wide product line, which includes everything from Linux-powered servers to Windows-based notebooks. The Admira NSV sits at the extreme end of the company's portable line. It's a subnotebook so small and light that it's nearly invisible.

The Admira NSV weighs just 3.4 pounds and is less than an inch thick. That's about as compact as full-featured notebooks come. But, despite its light weight and portability, there's a surprising amount of computing muscle under the hood.

At this price, the processor is a 600-MHz Intel Pentium III and the system includes just 64MB of SDRAM, which is meager these days. Both 700-MHz and 800-MHz CPUs are available as options. You can upgrade to 128MB of RAM for \$85, or to a maximum of 192MB. Acentia is sending a strong message: despite its diminutive stature, the Admira NSV can be a performance PC.

It should come as no surprise that there's just one spindle in this laptop. However, an external floppy disk drive and external CD-ROM drive are included in the purchase price, and can be attached simultaneously; the floppy disk drive is a USB device, while the CD-ROM drive connects through a dedicated port.

We liked the fit and finish of this PC. Its outer surfaces are covered in metallic blue while the inside surfaces have a brushed aluminum look. Rounded edges and a streamlined shape make this system a stylish addition to any executive's travel bag.

Acentia Admira NSV

PROS

- Super-light subnotebook
- E-mail notification light and quick access buttons
- Four USB ports
- Carrying case with drive pockets

CONS

- Fleeting short battery life
- Minimal RAM complement
- No parallel or serial connectivity
- Clumsy power switch

who would like to plug in a subnotebook when they reach the office.

More startling is the lack of any legacy ports. There's a VGA connector, but no serial, parallel, or even PS/2 ports. Instead, the system offers four USB ports, enough for a wide array of devices without a USB hub. That makes this PC a legacy-free dream—a mouse, keyboard, digital camera, and PDA cradle can all be connected at once. Two of the four connectors are Mini USB ports, however, so you'll need to purchase adapters for devices with full-sized USB connections.

The system includes an IEEE-1394 port, also known as FireWire. That means you can connect a DV camcorder, external hard drive, or other high-speed peripheral without adding a special adapter. The system's 10GB hard disk capacity, while not that large by today's standards, should provide adequate room to store all of your standard files and applications.

The system might be criticized for having just a single PC Card slot, but in fairness, it is a subnotebook and there's hardly room for a second slot. More importantly, the inclusion of a 56-Kbps modem and a 10/100BaseT Ethernet adapter means the PC Card slot may not even be needed.

Some laptops come with battery packs that have integrated testers—just pop the battery cover off your system, remove the battery, and press a button to see how much charge is available. Acentia improved on this design by adding a battery test button on the laptop's case. You can press the button, whether the PC is on or off, and see how much battery life is left. This is indicated with a set of four LED lights on the system's front face—the more LEDs lit, the more juice remains. The front face is also home to a volume dial and audio ports.

Since the system is so small—it measures only 10.5 inches across—the keyboard is a bit cramped. Overall, the keys are about ten percent smaller than those of typical laptops. This led to some sloppy typing, as our fingers frequently bumped into surrounding keys. The

Some Odd Choices

When it comes to ports and connectors, though, users are certain to either love or hate this PC—there's little middle ground. For starters, there's no port replicator available for this system, a liability for those

COMPAQ BUSINESS



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24X Max CD-ROM drive⁵
Integrated Mini PCI 56K modem³ and NIC combo
Weighs 5.9–7.2 pounds**
Microsoft® Windows® 2000 Professional
1-year limited warranty⁴

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128MB SDRAM
15" TFT (1400x1050) display
8X DVD-RDM drive⁵
Integrated Mini PCI 56K modem³ and NIC combo
Weighs 5.9–7.2 pounds**
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1-year limited warranty⁴

Armada M300 Notebook
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12GB SMART hard drive²
64MB SDRAM
12.1" TFT (1024x768) display
Integrated Mini PCI 56K modem³ and NIC combo
Weighs 3.2–3.4 pounds**
Microsoft Windows 2000 Professional
1-year limited warranty⁴



Compaq recommends Microsoft® Windows® 2000 Professional for business.

*Prices shown are Compaq prices; reseller and retailer prices may vary. Prices shown are subject to change and do not include applicable state and local sales tax, or shipping to recipient's destination. **Weights will vary based upon configuration. ¹Compaq Financial Services: Financing available through Compaq Financial Services Corporation (CFSC) to qualified commercial customers in the U.S. Financing is subject to credit approval and execution of CFSC documentation. Monthly payments are based on a 48-month Fair Market Value lease, and do not include taxes, fees, or shipping charges. Other fees and restrictions may apply, and CFSC reserves the right to change or cancel this program at any time without notice. ²For hard drives, GB=billion bytes. ³ITU V.90 modems (available on select models) are designed only to allow faster downloads from K56flex- or V.90-compliant digital sources. Maximum achievable download transmission rates are currently unknown, may not reach 56 Kbps, and will vary with line conditions. ⁴Some restrictions and exclusions

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system features an effective touchpad, though, and five easy-access buttons for launching favorite applications. By far our favorite feature is a small illuminated button on the front of the system that indicates when you have unread e-mail. When the button is lit, simply press the button to launch your mail client.

Ergonomically Sound

Overall, this laptop is designed with solid ergonomics. The USB ports are located on both the right and left sides of the case, making it easy to connect peripherals wherever they may be. A door covers the CD-ROM port and a single USB port, while the other ports are open and accessible. Our one complaint is with the Power switch—a spring-loaded slider. We generally dislike this kind of switch; they are not as durable as standard Power buttons and it's sometimes hard to tell

whether you've successfully turned the PC on.

You can slip the Admira NSV into a small travel bag with ease. If you need access to the floppy and CD-ROM drives, you might want to take along the included carrying case. This semi-rigid briefcase-style bag houses the laptop and external drives, with room left over for other accessories. One of those accessories should probably be the AC adapter, airplane power cable, or a spare battery—in our battery-rundown test, the Admira ran for only 1 hour and 18 minutes with all power management disabled.

The Admira NSV offered mediocre performance on our formal benchmark tests. Spending a bit more for upgrades to the processor and RAM would help that. In real-world tests, the notebook handled common office tasks well. Though the screen is just 12.1 inches, it displays applications in a full and vibrant 1,024

x 768 pixels. This smaller display is an asset for travelers. It keeps the system's size and weight to a minimum and opens easily on cramped airplane tray tables, where large-screen laptops may not. Since the display is powered by an ATI RAGE MOBILITY chipset, it performs well in both business and entertainment roles. Sound is provided by a Crystal audio chipset, which generates good audio with the laptop's small integrated speakers.

There's no software bundled with the Admira NSV, only a copy of Windows Me. Service is limited to a one-year warranty. Nonetheless, the system is priced nicely at \$1,725 and fills its role as a subnotebook quite well.

If you're shopping for a portable for running standard office applications, and want one that won't break your back or your bank account, the Admira NSV is a serious contender.

Compaq's Armada E500 series is a desktop-replacement notebook aimed at the enterprise buyer. The E500S is a scaled back version of the E500, based on the same platform, but with less extravagant features. The E500S is targeted to small and medium-sized businesses. It maintains modular cross compatibility with other Armada platforms, which is appealing to businesses that expect to expand their fleets of laptops.

The E500S has a three-spindle design. Compaq calls the system "lightweight and thin" in its press materials, but in fact, it's neither. At 7.2 pounds, it'll put a noticeable strain on your shoulder, and at 1.6 inches thick, no one will mistake it for a piece of paper. However, we don't expect waifish measurements in a three-spindle desktop-replacement notebook. The form factor is designed for users who don't need to travel with their laptops frequently. For those who desire a highly mobile system, Compaq offers two slimmer, lighter Armada series: the M700 and the M300.

The E500S has the advantage of convenience. With all of its drives

Compaq Armada E500S

\$2,899

Compaq Computer Corp.

P.O. Box 692000, Houston, TX 77269-2000; (800) OK-COMPAQ; www.compaq.com

Sales Channels: Direct, Retail, Resellers

CPU: 800-MHz Intel Pentium III

RAM/Expendable to: 128MB SDRAM/512MB

Drives: 10GB 4,200-rpm EIDE hard drive, 24X modular CD-ROM drive, 1.44MB modular floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE MOBILITY-P 2X AGP video with 8MB of SDRAM

Audio: ESS Moestro-2 hardware wavetable audio; integrated microphone and stereo speakers

Input: 87-key Windows keyboard, touchpad

Software: Windows 98, Microsoft Office 2000 SBE, Symantec Norton AntiVirus

PC Card Slots: Two Type II or one Type III, CardBus and Zamed Video enabled

Communications: Compaq 56-Kbps fax modem/10/100BaseT Ethernet adapter Mini PCI card

Ports: Parallel, serial, PS/2, VGA, line-in, headphone, mic, FIR, USB, docking station



Size/Weight: 12.4 x 10 x 1.6 inches/7.2 pounds with battery installed

Battery/Battery Life: 4,800-mAh Li-Ion/3 hours 37 minutes achieved with power management disabled

Service and Support: Three-year parts and one-year labor warranty, lifetime 24/7 toll-free tech support

Options: 2X LS-120 drive (\$199), CD-RW drive (\$399), Armada Port Replicator (\$149)

Norton SI32 Score: 406.1

internally mounted, the notebook is a tidy package. Compaq's MultiBay on the front panel contained a CD-ROM drive. Compaq sells a range of devices that will function with the MultiBay.

These include CD-RW and LS-120 drives, as well as a second battery. All work with the M700 and M300 lines as well. The E500S sports a modular floppy drive that can be replaced with

a third battery for extended computing time on the road.

The laptop held on for more than 3.5 hours in our battery-rundown test (using only its primary battery). With all three batteries installed, runtimes upward of eight hours should be possible.

Our review unit contained a rip-snorting 800-MHz Pentium III processor. Fast enough for even very CPU-intensive tasks, the 800-MHz PIII scored well in the PassMark PerformanceTest benchmark. For most users, this processor provides more than enough power. It uses Intel's Speed-Step power-conservation technology to extend battery life.

The E500S is available with a modem/Ethernet combination Mini PCI card. This is a boon to users who connect to a network in the office, but also dial into an ISP at home or on the road. The full-sized ports on the right side of the machine are more convenient than a dongle-equipped PC card (the Ethernet port even has activity lights). The integrated communications hardware frees up the PC Card slots for other uses. If you don't need an Ethernet adapter, the system can be had with a modem-only Mini PCI card.

Although the E500S isn't a full-time traveler (unless you're particularly weight tolerant) it's sturdy enough to take the hard knocks of transportation. The base of the unit feels solid and durable.

The screen, which is generally the most vulnerable component of a laptop (along with the hard drive), is encased in a carbon-fiber frame to prevent damage. Pressing on the back of a notebook's screen while it's turned on gives you an idea of how well it's reinforced; if the screen shows discoloration as you apply pressure to the lid, that's a warning sign. Interestingly, the E500S shows discoloration when pressure is applied to the edges of the screen, but

not when the middle is pressed. We'd prefer to see no discoloration, but the carbon fiber backing provides good (if not perfect) protection.

The E500S's quality LCD is driven by ATI's RAGE MOBILITY-P chipset. Coupled with 8MB of SDRAM, this chipset is one of the most widely used in laptops. It provides good performance (by notebook standards) and has the additional benefit of multimonitor sup-

port. Using the VGA port on the E500S, the Windows desktop can be spread across two monitors running at different resolutions (the LCD and an external monitor). A composite video output is included, for sending the display to a television or projector.

Compaq includes a solid software package with the E500S.

Microsoft Office 2000 Small Business Edition will take care of the most commonly needed productivity applications. Norton AntiVirus should keep the PC free of viral infection. Compaq also provides a system restore disc that wipes the hard drive and reinstalls all the original software.

The E500S features a sturdy and comfortable keyboard with a natural layout. The touchpad is large and responsive, though the texture provides a bit more friction than we'd like. The buttons are well placed and neither too resistant nor too soft. The laptop also features two buttons on the front edge that control volume level and four hot-buttons above the keyboard that launch commonly used applications, like an e-mail program or Web browser.

One performance glitch we encountered in the E500S was an abnormally long boot time. A system of this caliber should take less than a minute to boot Windows 98, but the E500S took over 1 minute and 45 seconds. We tested two systems and had the same results with both. This protracted boot process seems to be caused by the system waiting for some timeout to expire.

It's not a huge issue, but it is an annoyance.

Compaq backs the E500S with a three-year parts warranty and one year of labor coverage. Compaq can usually get a defective unit back into the user's hands within 48 hours. Tech support is complete, with 24/7 support available for the life of the machine.

A notebook with similar performance can be had for less, but the compatibility of the E500S's modular components with other Armada systems is attractive to businesses that already have an installed base of Armada notebooks. The laptop is solidly constructed and offers strong performance.

Compaq Armada E500S

PROS

- Three-battery potential for long running times
- Modular devices compatible with other Armada systems
- Fully integrated communications hardware

CONS

- Long boot time
- Somewhat expensive

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Compaq's Armada E500 is the high-end entry in this vendor's popular corporate line. As with other Armada models, the E500 has a modular bay, which, in our review system, housed an 8X DVD-ROM drive. This bay can be used with the full gamut of Armada modular bay devices, including a CD-RW drive, a second hard disk, or a second battery pack. The Armada docking station and port replicator, designed to work with all Armada notebooks, can also be used with the E500.

In terms of design, there's nothing breathtaking about the Armada E500. It has a standard three-spindle design, with a standard 1.44MB floppy disk, the 8X DVD-ROM drive, and the large, 20GB hard drive. The hard drive is an EIDE model, with transfer rates much slower than the ATA/33 and ATA/66 interfaces found on drives in many other notebooks, but this did not have any noticeable negative effect on performance. This drive incorporates SMART technology, which warns the user of impending drive failure. A Mini PCI card provides both the 56-Kbps fax modem and 10/100BaseT Ethernet adapter.

At the heart of the Armada E500 is the very fast and powerful Mobile Pentium III processor. The motherboard will support up to 512MB of RAM, though our review system had 128MB of RAM, which is fine for virtually any application.

With higher end laptops such as this one, purchasers generally expect to receive everything. In addition to great performance, they want features such as terrific multimedia. The Armada E500 won't be a disappointment in either area. Many laptops purchased for corporate use feature displays somewhat smaller than the Armada E500's 15-inch beauty. That's a reasonable place to save some money, but with the large screen the Armada E500 offers, you can easily work on the system for hour after hour without suffering eyestrain. In fact, the Armada E500 offers the same screen size as many popular flat-panel monitors.

The screen is driven by the ATI RAGE

Compaq Armada E500

\$3,799

Compaq Computer Corp.

P.O. Box 6920000, M12008, Houston, TX 77269; (800) OK-COMPAQ; www.compaq.com

Sales Channels: Direct, Retail, Resellers, VARs

CPU: 850-MHz Intel Pentium III

RAM/Expendable to: 128MB SDRAM/512MB

Drives: 20GB 4,200-rpm EIDE hard drive, modular 8X DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 15-inch XGA active-matrix display; ATI RAGE MOBILITY-P 2X AGP video with BMB of SDRAM

Audio: ESS Maestra-2E hardware wavetable audio; integrated stereo speakers and microphone

Input: 86-key Windows keyboard, touchpad

Software: Windows 2000

PC Card Slots: Two Type II or one Type III, CardBus and Zamed Video enabled

Communications: 56-Kbps fax modem/10/100BaseT Ethernet adapter Mini PCI card

Ports: Parallel, serial, PS/2, VGA, composite-video-out, mic, headphone, FIR, USB, docking station

Size/Weight: 12.5 x 10.2 x 1.7 inches/7.2 pounds with battery installed



Battery/Battery Life: 4,800-mAh Li-Ion/3 hours 35 minutes achieved with power management disabled

Other: Kensington lock slot

Service and Support: One-year parts and labor warranty, 24/7 toll-free tech support

Options: LS-120 drive (\$199), CD-RW drive (\$399), ArmadaStation (\$691), Armada port replicator (\$149)

Norton SI32 Score: N/A

MOBILITY-P chipset with 8MB of video RAM. This provides 2X AGP graphics performance, and we had excellent results on all of the applications that we ran. The MOBILITY-P chipset has hardware DVD acceleration as well as motion compensation to improve DVD playback, though actual MPEG-2 decoding is performed by the InterVideo WinDVD player utility. This provided excellent DVD performance on all of the DVDs we tested, including a badly scratched disc. None of the movies that we

watched exhibited any aliasing, hesitations, or artifacts.

To complement the large screen, which is the perfect size for presentations to moderate-sized groups, the laptop provides a composite-video-output jack. This allows you to use a large-

screen TV as a display device, or record the output of the Armada E500 on a VCR or camcorder.

Audio is excellent, as well. It's provided by the ESS Maestro-2E hardware wavetable chipset. However, the speakers are located in the palm rests, where they can be muffled by your hands while typing.

Compaq Armada E500

PROS

- Great performance
- Excellent multimedia
- Very good battery runtime

CONS

- Expensive
- Speaker grilles are in palm rests

Though for the end-user the operating system is not too different to work with, you will need to examine your existing Windows-based applications. Although many of the more recent releases of 32-bit Windows applications run well on Windows 2000, some applications made for Windows 95 or 98 will have difficulty running correctly with this operating system. However, we had no such troubles with the applications we used to test the Armada E500. Photoshop 6.0 works well on the Armada E500, and the large

15-inch display makes it a very practical application.

In fact, the way the Armada E500 is configured, it is an excellent system to consider as your only PC, since it performs well both on the road and in desktop-replacement mode.

When traveling with the Armada E500, its 7.2-pound weight can be burdensome. At the same time, you'll appreciate the large screen and good battery runtime. The 4,800-mAh Li-Ion battery kept our review unit running for an impressive 3 hours and

35 minutes with all power management, except for SpeedStep, disabled.

The only real criticism we have for the Compaq Armada E500 is that it's moderately expensive. Most Compaq models demand some premium, especially in the Armada line. Moreover, our test unit is a heavily configured system, with lots of RAM, a big hard disk, a giant screen, and the fastest CPU currently available—all of which increase the price. If you can afford it, this is a terrific laptop, well worth that price.



If you've been drooling over the new Inspiron 8000, but can't afford its sticker price, Dell has a pleasant surprise in the form of the Inspiron 4000. It lacks some of the features of the higher end 8000 series, but there's no mistaking that it's an Inspiron. This one, however, is much more affordable.

The Inspiron 4000 has the same new design scheme as the more expensive 8000 model. User-changeable color plates accent the system's palm rests and lid. Four different sets are included, so you can change your laptop to match your wardrobe or your mood.

Not only does the Inspiron 4000 look good, but it runs well, too. It's fitted with an excellent array of internal components, starting with an 800-MHz Intel Mobile Pentium III CPU. The CPU is mounted on a motherboard based on Intel's 440BX core logic chipset. The motherboard can accommodate up to 512MB of RAM, though the 128MB our review unit contained should be enough for most users.

The Inspiron 4000 has a two-spindle design, with a 20GB ATA/33 hard disk mounted internally. A media bay can hold the 1.44MB floppy disk drive, the 8X DVD-ROM drive, or an optional CD-RW drive.

The two-spindle design offers more than just light weight. The bay that holds the second "spindle" can also be used to accommodate an optional second Li-Ion battery, if you can make do with just the hard disk drive. This should extend the battery runtime to over seven hours, long enough to get some real work done on an

Dell Inspiron 4000

\$2,298

Dell

One Dell Way, Round Rock, TX 78682; (800) 388-8542; www.dell.com

Sales Channel: Direct

CPU: 800-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 20GB 4,200-rpm ATA/33 hard drive, 8X modular DVD-ROM drive, 1.44MB modular floppy drive; two-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE MOBILITY 128 2X AGP video with 8MB of SDRAM

Audio: ESS Maestra-2E hardware wavetable audio; integrated stereo speakers and microphone

Input: 87-key Windows keyboard, touchpad and pointing stick

Software: Windows Me, Microsoft Works Suite 2001 with Money 2001

PC Card Slots: Two Type II or one Type III, CardBus and Zamed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, headphone, mic, FIRE, USB, docking station

Size/Weight: 12.5 x 10 x 1.5 inches/5.6 pounds with battery installed



Battery/Battery Life: 3,600-mAh Li-Ion/4 hours 20 minutes achieved with power management disabled

Other: Kensington lock slot, lid and palm-rest color inserts

Service and Support: One-year parts and labor warranty, lifetime 24/7 toll-free tech support

Options: Extra Li-Ion battery (\$99), Xircam CardBus Ethernet PC Card (\$119), 8X CD-RW drive (\$200)

Norton SI32 Score: 420.6

international flight.

The Inspiron 4000 also provides two cursor-control devices. Along with the standard touchpad, a pointing stick is featured, and both are active all the time.

While terrific multimedia is not really necessary on a business system, it's important for a home computer, and the Inspiron 4000 is a good choice for either role. Business and home users will both appreciate the large 14.1-inch display. It's large enough to view comfortably for hours on end, or to make presentations to small groups, without using a separate display device. The system features an S-Video-output jack, so if you wish to

connect it to a large-screen TV or other AV device, you can do so.

This display is driven by an ATI MOBILITY 128 chipset, which provides 2X AGP performance and has 8MB of video RAM. The MOBILITY 128 also provides hardware DVD acceleration and motion compensation for full-screen DVD playback. MPEG-2 decoding is performed by the InterVideo WinDVD player included. In testing various DVDs, we generally experienced excellent performance, though our badly scratched disc did show some hesitations.

Audio is not generally a deciding factor in a laptop purchase. For those who insist

upon good audio, however, the Inspiron 4000 won't disappoint. Dell has chosen the popular ESS Maestro-2E chipset, which provides wavetable-quality sound. The internal speakers are acceptable for a laptop. Plug in a decent set of external speakers and you will be quite pleased with this system's audio quality.

While the Inspiron 4000 is more popularly priced than the 8000 series, it is available with many of the same processor options. Our review configuration featured the 800-MHz Intel Mobile Pentium III CPU. SpeedStep technology drops the clock speed to 700 MHz when operating on battery power.

Dell Inspiron 4000

PROS

- Terrific battery runtime
- Very good performance
- Nice multimedia capabilities
- Lightweight design

CONS

- Two-spindle design
- Just a one-year warranty

In formal benchmarking, as well on real-world applications, the Inspiron 4000 performed admirably. Its 14.1-inch screen is as large as some flat-panel monitors, so the Inspiron 4000 could be used as a desktop replacement, though its two-spindle design might prove a bit limiting in this role.

As a portable powerhouse, the Inspiron 4000 really shines. It is equally at home on your desk or at 35,000 feet. When traveling, the two-spindle design will be appreciated for its contribution to the

system's sub-six-pound carry weight.

We were also impressed with the Inspiron 4000's battery runtime. The

modest 3,600-mAh Li-Ion battery pack in our test system lasted an amazing 4 hours and 20 minutes in our battery-rundown test with all power management (except SpeedStep) disabled. Dell claims a more modest 3.5 hours of battery life, so we can't promise that every unit will perform as well as our test system did.

If you need to have all three drives available most of the time, you will find this system's two-spindle design awkward. For those who don't often need both a floppy and optical drive, however, the Inspiron 4000 is just about perfect. It's light enough for travelers, and powerful enough to handle just about any task. It's not the least expensive 800-MHz laptop we've tested, but it's also far from being the most expensive laptop in its class. That adds up to a winning combination.

Dell's Inspiron 8000 proves that beauty is more than skin deep. The Inspiron 8000 looks great, with its four, interchangeable colored palm rests. Dell does not sacrifice any performance to good looks; you get them both with the Inspiron 8000. Powering the laptop is an 800-MHz Intel Mobile Pentium III processor. It resides in a motherboard built around Intel's 815E core logic chipset, which provides a 4X AGP video bus. The motherboard can accommodate up to 512MB of RAM, and access to the DIMM sockets is easy via a small door on the bottom of the laptop. Our test configuration was equipped with a generous 128MB.

The Inspiron 8000 has a three-spindle design. The hard disk is a large 20GB model, and it uses a fast ATA/100 interface. The optical drive is fixed, and can be an 8X DVD-ROM drive, like the one in our review machine, a standard 24X CD-ROM drive, or a CD-RW drive. A modular Media Bay holds the 1.44MB floppy disk drive, but can also accommodate a variety of optional modules, including a Zip drive, a second hard drive, a different optical drive, or a second battery pack. Also built into our review unit was an internal 56-Kbps fax modem. If you need Ethernet connectivity, you can add a 10/100BaseT Ethernet adapter for \$119 more.

No matter which applications you

Dell Inspiron 8000

\$3,254

Dell
One Dell Way, Round Rock, TX 78682; (800) 388-8542; www.dell.com

Sales Channel: Direct

CPU: 800-MHz Intel Pentium III

RAM/Expendable to: 128MB SDRAM/512MB

Drives: 20GB 4,200-rpm ATA/100 hard drive, 8X DVD-ROM drive, 1.44MB modular floppy drive; three-spindle design

Video: 15-inch SXGA+ active-matrix display; ATI RAGE MOBILITY-M4 4X AGP video with 32MB of SGRAM

Audio: ESS Maestro-2E hardware wavetable audio; integrated stereo speakers and microphone

Input: 87-key Windows keyboard, touchpad

Software: Windows 2000, Microsoft Office 2000 SBE

PC Card Slots: Two Type II or one Type III, CordBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, S/PDIF-out (on dangle), line-in, headphone, mic, FIR, two USB, IEEE-1394, docking station

Size/Weight: 13 x 10.8 x 1.7 inches/7.9 pounds with battery installed

Battery/Battery Life: 3,800-mAh Li-Ion/2 hours 57 minutes achieved with power management disabled



Other: Kensington lock slot

Service and Support: Three-year parts and one-year labor warranty, lifetime 24/7 toll-free tech support

Options: Zip100 drive (\$139), second 20GB hard disk (\$270), second battery (\$99), CD-RW drive (\$299), advanced part replicator (\$199), 10/100BaseT Ethernet (\$119)

Norton SI32 Score: N/A

use, the Inspiron 8000 can handle them. Whether you need to make a presentation or work on an important document or report, the large, 15-inch screen presents a sharp and bright image. The default resolution of 1,400 x 1,050 (SXGA+) might be a bit cramped for some applica-

tions, such as word processing, but we found the display quite readable on all of the applications we tested.

Dell uses the new ATI MOBILITY-M4 video chipset to drive the display. When coupled with the Intel 815E core logic chipset, the M4 offers 4X AGP performance

with a surprising 32MB of video RAM. This is the same amount you'll often find in high-performance desktop video cards, but it's rare to find a laptop so well equipped. Along with blistering performance on most video applications, the MOBILITY-M4 provides hardware DVD acceleration and motion compensation for full-screen DVD playback. We found the Inspiron 8000's DVD playback excellent. We saw no hesitations, artifacts, or aliasing, even on a badly scratched test disc.

The Inspiron 8000 provides two video outputs—a mini DIN connector for S-Video and a dongle that provides composite-video output. This same cable also provides a S/PDIF output for Dolby Digital audio output. Hardware wavetable audio is produced by the ESS Maestro-2E chipset.

Besides the various video and audio outputs, the Inspiron 8000 has an IEEE-1394 port. This can be used with a digital camcorder for video capture, though the software needed to perform this function

is optional, and was not included with our review unit.

Dell offers the Inspiron 8000 with any of Intel's Mobile Pentium III processors. Our configuration included the 800-MHz

version—just 50 MHz down from what is currently the fastest mobile CPU.

Since the Inspiron 8000 uses the Intel 815E, a desktop core logic chipset, it doesn't support Intel's SpeedStep technology. Instead, the system's BIOS incorporates a special CPU power-management setting that varies the clock speed

of the processor in much the same way that SpeedStep does: full speed when plugged into a power outlet, and a slower clock speed when running on battery power. Our battery-rundown test was performed with this BIOS setting disabled.

Dell appropriately touts the performance and versatility of the Inspiron 8000, which is a good choice for desktop or mobile use. On the desktop, the 15-inch screen, comfortable keyboard, and large hard disk make the laptop very usable. While you

might want to add a full-sized keyboard or an external numeric keypad, you'll find that the Inspiron 8000 provides excellent performance for almost any task.

Our review system came with the Windows 2000 operating system, though you can also order it with Windows Me. Many 32-bit applications run well under Windows 2000, and Dell includes Microsoft Office 2000 Small Business Edition with the laptop. If you plan to install older applications, make sure Windows 2000 supports them.

The Inspiron 8000 has a fairly modest 3,800-mAh Li-Ion battery pack. However, with all power management disabled, it powered the machine for 2 hours and 57 minutes. That's pretty impressive, considering how well configured our system was. Should you need more portable runtime, the Media Bay, which normally holds the floppy disk drive, can also accommodate a second battery pack.

The Inspiron 8000 isn't perfect. At nearly eight pounds, it's too hefty for frequent travelers. It's also expensive. However, this system really delivers on performance, runtime, and style, so if your budget can take it, it's a terrific choice.

Dell Inspiron 8000

PROS

- Terrific multimedia
- Very good performance
- Great looking
- Excellent display

CONS

- Expensive
- Weighs almost eight pounds

The APT38W2 from ePortables is a large-screen laptop with lots of power at a reasonable price. It features a large, 15.1-inch TFT display and three-spindle design, but weighs a manageable seven pounds.

Powering the APT38W2 is a fast 750-MHz Intel Pentium III processor. This is the mobile version of the CPU, which incorporates SpeedStep technology to drop the clock speed down to 600 MHz when operating on batteries. This helps to extend battery runtime and reduce heat buildup, while maintaining a high level of performance. The processor is mounted in a motherboard based on the Intel 440BX core logic chipset, and can accommodate up to 512MB of RAM. Our review unit had 128MB installed. The hard disk drive, an 18GB ATA/66 model, is generous. An 8X DVD-ROM drive provided the third spindle.

We've reviewed many smaller screen laptops with 12- or 13-inch screens,

ePortables APT38W2

\$2,499

ePortables, Inc.

15352 Valley Blvd., City of Industry, CA 91746, (888) 388-2128; www.eportables.com

Sales Channels: Direct, Retail, Resellers, VARs

CPU: 750-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 18GB 4,200-rpm ATA/66 hard drive, modular BX DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 15.1-inch XGA active-matrix display; ATI RAGE MOBILITY 128 2X AGP video with 16MB of SDRAM

Audio: ESS Maestro-2E hardware wavetable audio; integrated stereo speakers and microphone

Input: 87-key Windows keyboard, touchpad

Software: Windows Me

PC Card Slots: Two Type II or one Type III, CardBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, line-in, headphone, mic, FIR, USB, docking station

Size/Weight: 13.5 x 10.9 x 1.7 inches/7 pounds with battery installed



Battery/Battery Life: 5,400-mAh Li-Ion/3 hours 30 minutes achieved with power management disabled

Other: Kensington lock slot, carrying case

Service and Support: One-year parts and labor warranty, toll-free tech support 9 a.m. to 6 p.m. (PST) M-F

Options: Second Li-Ion battery (\$175), 100MB Zip drive (\$199), Ethernet PC Card (\$69), port replicator (\$199)

Norton SI32 Score: 388.4

and there's a very noticeable difference between those displays and the APT38W2's 15.1-inch panel. For most applications, a somewhat smaller screen is fine. There are times, though, when you appreciate having as much visual real estate as possible. When you are using the APT38W2 for hours on end, the larger screen offers a very crisp and usable display for any type of application. It is also excellent for presentations to modest-sized groups.

Because of the large screen size, the top of the laptop overhangs the bottom slightly on three sides. This adds some bulk but does not make the APT38W2 appreciably more difficult to carry.

Driving the display is the high-powered ATI RAGE MOBILITY 128. This chipset, one of the newest from ATI, has 16MB of RAM, which is a considerable amount in any system, especially a laptop. The APT38W2 showed excellent video performance on the games we tested, as well as the more business-oriented applications. The ATI chipset also provides hardware DVD acceleration, though the actual MPEG-2 decoding is performed by the included Mediamatics DVDEExpress software player.

DVD playback performance was excellent on most of the DVDs we tested, though one badly scratched test disc did have a number of skips and hesitations. An S-Video-output jack is provided, so you can share a DVD movie or display your presentation on a large-screen television or other monitor with S-Video inputs.

Audio quality is good. It's provided by an ESS Maestro-2E chipset, which offers hardware wavetable audio. The speakers are mounted under the palm rests but are ported out of the side panels, so the audio won't be muffled while you type.

Very Good Performance

While the 750-MHz Mobile Pentium III that powers the APT38W2 isn't the fastest one offered for mobile use, it is nonetheless a very powerful CPU, and using it keeps the price of the laptop down considerably. The

performance of this system was excellent, thanks in large part to the generous 128MB of RAM and the ATA/66 hard disk drive. When it's connected to the AC power supply, the 750-MHz speed of the APT38W2 is enough to easily run compute-intensive applications, such as Photoshop, or video-editing programs like Adobe's Premiere.

Other business-oriented applications, such as accounting or payroll, will also run very nicely on the APT38W2, and the

18GB hard drive is spacious enough to accommodate the large files that many of these applications generate.

Along with the 15.1-inch TFT screen, the power of the APT38W2 makes it a prime candidate for use as a desktop-replacement system. A docking station/port replicator connector on the rear panel of the APT38W2 is for the optional port replicator (\$199). When connected, this device lets you hook up peripherals, such as a full-sized keyboard or mouse, or a printer, and easily detach the laptop when it's time to hit the road.

A built-in 56-Kbps fax modem makes it easy to surf the net, and two Type II PC Card slots are available. However, only a single USB port is provided. This may or may not be inconvenient for you. If it is, 4-port USB hubs can be found for about \$20 at almost any office supply or computer store. Nonetheless, you may need one of these hubs sooner, rather than later, especially if you intend to use a full-sized keyboard and mouse. The APT38W2 has just one PS/2 port, so you will most likely have to use USB peripherals for one or both of these input devices.

For such a heavily configured system, the APT38W2 provided an excellent battery runtime. In our battery-rundown test, in which we disable all power management except SpeedStep, the APT38W2 ran for 3 hours and 30 minutes. That's enough time to get a lot of work done on a long flight, or enjoy two short DVD movies.

SpeedStep can be disabled in the BIOS, should any applications require the utmost power that the laptop is capable of

offering, even when operating portably. However, if you disable the SpeedStep technology, expect to lose some runtime.

Overall, we found very little about the APT38W2 to criticize. While the laptop is slightly bulky due to the large screen, it isn't exceptionally heavy. If you spend a lot of time on the road, you may want to opt for an ultralight model instead. For many users, however, the ePortables APT38W2 is a perfect laptop, with plenty of capability, whether sitting on your desk or on a tray table at 35,000 feet.

Intel SpeedStep

When you're working on the road with your laptop, it has to conserve energy so it doesn't drain its battery too quickly. Because of this, mobile processors have always been designed for power management first and performance second. There are many times, though, when notebook users don't care how much power their PCs are drawing, typically when the laptop sits on a desk plugged into a power outlet. To address this concern, or lack thereof, Intel introduced its SpeedStep technology.

With SpeedStep, a processor operates like any other mobile chip when the system is connected to an AC outlet. When the notebook is running on battery power, the CPU frequency is reduced, allowing the chip to draw less current and operate at a lower voltage. For example, a 750-MHz Mobile Pentium III runs at 600 MHz in low-power mode. This simple technology allows notebook PCs to achieve performance levels much closer to those of desktop systems when they can fully exploit AC power.

Operating system and BIOS manufacturers have caught on to the separate roles that laptops play on the road and on the desktop, designing separate power-management features for battery and AC use. Features like automatic screen dimming and hard drive standby are great when you're on the road and need to conserve battery power, but when you've got your laptop on a desk and plugged into an AC outlet, these features are more annoying than anything else. At that time, you'd rather have all the performance your system can provide.

With the ability to switch power modes depending on its electrical source, a notebook using SpeedStep technology effectively offers two processors in one. On the road, a 600-MHz CPU will offer more than enough performance to handle word processing, spreadsheets, FreeCell, and other standard applications, while drawing so little electricity that it allows the system to run for up to four hours. At your desk, though, the notebook's higher speed lets you take a photo editing, MPEG-2 decoding, 3D games, or virtually anything else you might want to throw at it.

If you feel the need to run these high-end applications on the road, though, you'll be glad to know that SpeedStep can be configured to provide full processing performance regardless of the power source. □

ePortables
APT38W2

PROS

- Very good performance
- Excellent battery runtime
- Great multimedia

CONS

- Somewhat bulky
- Only one USB port

FOSA 340S-4

\$2,010

FOSA Computer, Inc.

120 Corporate Blvd., S. Plainfield, NJ 07080; (800) 216-3672; www.fosa.com

Sales Channels: Direct, Retail, Resellers

CPU: 800-MHz Intel Pentium III

RAM/Expandable to: 256MB SDRAM/256MB

Drives: 20GB 4,500-rpm ATA/33 hard drive, 24X modular CD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; SiS630 AGP video with BMB of system RAM

Audio: SiS701B software wavetable audio; integrated stereo speakers and microphone

Input: 85-key Windows keyboard, touchpad

Software: Windows 98

PC Card Slots: Two Type II CardBus and Zamed Video enabled

Communications: 56-Kbps internal fax modem, SiS 100BaseT internal Ethernet adapter

Ports: Parallel, serial, PS/2, VGA, line-in, headphone, mic, FIR, USB

Size/Weight: 12.4 x 10 x 1.5 inches/6.5 pounds with battery installed



Battery/Battery Life: 3,200-mAh Li-Ion/2 hours 25 minutes achieved with power management disabled

Other: Kensington lock slot, carrying case

Service and Support: One-year parts and labor warranty, lifetime toll-free tech support 9:00 a.m. to 6:00 p.m. M-F

Options: DVD package (\$130), CD-RW drive (\$299)

Norton SI32 Score: 302.4

Housed in a sleek, attractive silver case, the FOSA 340S-4 is, in most respects, a generic mid-range laptop. It has a nice 14.1-inch display and a basic three-spindle design. FOSA uses a standard 800-MHz desktop Intel Pentium processor. Mounted in a compact "flip-chip" package, this CPU provides plenty of power, though it lacks the SpeedStep technology offered by the Mobile PIII. The desktop and mobile versions use the same .18-micron fabrication technology, which prevents the desktop chip from generating an overly large amount of heat, but the SpeedStep technology in the mobile version helps to achieve longer battery runtimes.

The laptop's motherboard is built around a core logic chipset from SiS, the SiS630. The motherboard will accommodate a maximum of 256MB of RAM, and that's what was installed in our review system.

The FOSA 340S-4 weighs in at 6.5 pounds; not too hefty for a three-spindle laptop. The hard disk is a 20GB ATA/33 model, which provides a nice amount of space for applications. The optical drive is a 24X CD-ROM, while the floppy is a standard 1.44MB drive. Also included are an internal 56-Kbps fax modem and an SiS Fast Ethernet adapter.

The FOSA 340S-4 does not include a particularly strong multimedia system. While the 14.1-inch display is large, bright, and crisp, the video controller is integrated in the core logic chipset. This is becoming common, particularly in lower priced laptops, but generally has an effect on overall system performance as well as video

FOSA 340S-4

PROS

- Lightweight
- Nice sized screen
- Built in Ethernet adapter
- Loads of RAM

CONS

- Modest performance
- Relatively short battery runtime
- No port replicator connector
- Tech support is limited to business hours

use of system RAM as video RAM. Our test system was configured to use 8MB of system RAM, though this can be changed in the BIOS to as little as 4MB or as much as 32MB. Since our review unit had 256MB of RAM, we didn't notice any performance hit.

Audio is generated by a separate SiS 7018 controller, which provides wavetable-quality sound. The speakers are typical small laptop fare, but they are located at the top of the keyboard, where they won't be muffled by your hands while typing. Sound quality from the built-in speakers is adequate, though it is actually quite nice when played through even a modest set of external speakers, such

as the Altec Lansing ACS33s we keep on the test bench.

Like many business laptops, the FOSA 340S-4 has a CD-ROM drive rather than DVD-ROM. It is a standard 24X model. Should you want a DVD-ROM drive, one is available as an option, as is a CD-RW drive.

Modest Performance

With its 800-MHz Pentium III processor and 256MB of RAM, we would have expected the FOSA 340S-4 to offer better performance. That's not to say its performance was poor; it simply wasn't anything special. Any 800-MHz laptop is going to breeze through most applications. However, testing the FOSA 340S-4 side by side with another vendor's 800-MHz offering showed that the FOSA ran noticeably slower in some processor-intensive applications, such as rendering a large file in Photoshop. This performance difference would probably not be noticed without a direct comparison.

The 14.1-inch display in the FOSA 340S-4 makes it quite usable as a desktop replacement. It does not offer a port replicator or docking-station port, though there is a number of third-party devices available that attach through a USB port or PC Card slot.

Less impressive is the FOSA 340S-4's battery-rundown performance. The laptop comes with a Li-Ion battery pack with a 3,200-mAh capacity. That's not much to start with, and the lack of SpeedStep technology in the desktop Pentium III processor doesn't help matters. With all power management disabled, the FOSA

performance. For general business applications, you probably won't notice the SiS630 video. Video-intensive applications, however, will lag behind in performance as compared to a dedicated video subsystem.

Using the SiS630 core logic set to control video has another detrimental effect on overall system performance—the

340S-4 ran for a disappointing 2 hours and 25 minutes.

The FOSA 340S-4 isn't a bad choice for the money. It has a nice screen and a generous amount of RAM and hard disk space. The built-in Ethernet adapter

is handy if you have a network in your office.

Similarly configured laptops from other vendors offer similar or better feature sets, for somewhat less money. Tech support, while toll free, is available only

during business hours. If you need the peace of mind that comes with after-hours or weekend support, you'll need to look elsewhere. We liked the FOSA 340S-4, but some judicious shopping should get you a bit more for your buck.

The emphasis is on price with the FutureTech FM34XF3. This is a reasonably priced three-spindle laptop with a nice 14.1-inch screen. A modest, 10GB ATA/66 hard disk drive is supplemented by a standard 1.44MB floppy disk drive and 8X DVD-ROM drive. Powering the FM34XF3 is an 800-MHz Intel desktop Pentium III. The motherboard, which uses the SiS 630 core logic chipset, can accommodate up to 512MB of RAM, and our review system was provided with a generous 128MB.

FutureTech touts the FM34XF3 as a desktop replacement, and for most applications on the desktop, the 14.1-inch screen should be fine. The display is crisp, bright, and easy to read. Our review unit had a single dead pixel, located almost in the center of the screen.

As a mid-range system, this unit is not a videophile's dream. The video controller is built into the SiS 630 core logic chipset. SiS calls this an "UltraAGP" architecture. It's not a real AGP, however, as there's no separate video bus. Video memory is borrowed from the system RAM. You can adjust the amount between 4MB and 32MB. The FM34XF3 does include a lot of system RAM, so using a moderate amount for video doesn't have much of an impact.

DVD performance was generally good, with the Intervideo WinDVD utility used to decode the MPEG-2 files. We did, however, notice a small amount of hesitation when playing a badly scratched test disc. Other DVD movies played nicely.

Audio is also embedded. The quality is very good because of software wavetable synthesis. The

FutureTech FM34XF3

\$1,899

FutureTech Systems, Inc.

440 Rte. 17 N., Ste. 8, Hasbrouck Heights, NJ 07604; (800) 275-4414; www.futuretec.com

Sales Channels: Direct, Resellers, VARs

CPU: 800-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 10GB 4,200-rpm ATA/66 hard drive, 8X DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; SiS 630 AGP video shares system memory (4MB to 32MB)

Audio: SiS 630 software wavetable audio; integrated stereo speakers and microphone

Input: 87-key Windows keyboard, touchpad

Software: Windows 98, Corel WordPerfect Office 2000 with Dragan NaturallySpeaking

PC Card Slots: One Type II or one Type III, CardBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem, 10/100BaseT internal Ethernet adapter

Ports: Parallel, serial, PS/2, VGA, headphone, mic, FIR, USB

Size/Weight: 12.4 x 10.1 x 1.5 inches/6.5 pounds with battery installed



Battery/Battery Life: 3,200-mAh Li-Ion/2 hours 20 minutes achieved with power management disabled

Other: Kensington lock slot, carrying case, USB video camera with capture and video mail software

Service and Support: One-year parts and labor warranty, toll-free tech support 9 a.m. to 7 p.m. M-F (EST)

Options: Upgrade to 20GB hard drive (\$145)

Norton SI32 Score: 314.5

speakers are typical laptop fare, but they are well placed at the top of the keyboard.

The FM34XF3 provides both a 56-Kbps fax modem and an internal 10/100BaseT Ethernet adapter. It does not, however, provide any sort of S-Video or composite-video output, which might prove limiting.

Also missing is any connector for a port replicator or docking station. You can always use one of the universal port replicators now being offered by third-

party vendors, but be careful. The FM34XF3 has only a single USB port.

Moreover, it lacks dual Type II PC Card slots. The slot looks like a set of stacked Type II slots but has only a single connector. The slot is large enough to accept a single Type III card.

The FM34XF3 uses a desktop Pentium III CPU running at 800 MHz. For the latest generation of Pentium III processors, the use of a desktop version, rather than the mobile version, has become less of an issue. With the newer fabrication technology, desktop processors do not generate the large amount of heat that was once a potential problem when they were used in laptops.

The 800-MHz Pentium III used in the FM34XF3 doesn't offer SpeedStep technology, but this shouldn't be a problem in the long term. At the same time, the FM34XF3 did not deliver the level of performance we would have

FutureTech M34XF3

PROS

- Good price
- Generous amount of RAM
- Includes video camera and carrying case

CONS

- Desktop CPU
- Modest performance
- Short battery runtime
- Video shares system RAM
- PC Card slot supports only one card

expected, either in formal benchmarking or with some real-world applications. Systems that use the core logic chipset to provide video and/or audio controllers tend to deliver a lower level of performance. This is not a surprise, since dedicated hardware should perform better than a multitasking chipset.

You won't notice this performance differential using any of the software provided with the FM34XF3, such as Corel WordPerfect Office 2000, as even a mediocre 800-MHz processor is very fast. It was only in performing some very demanding tasks, such as rendering large files in Photoshop, that a performance hit was evident. On this type of task, the FM34XF3 was noticeably slower than several other 800-MHz laptops, and even a 700-MHz laptop completed

these tasks more rapidly. This should be a consideration if you intend to use the FM34XF3 primarily as a desktop-replacement system.

Performance took another hit, in the area of battery runtime. This system uses a 3,200-mAh Li-Ion battery, a relatively modest-sized unit, especially for a system that does not offer SpeedStep technology. Battery-rundown testing is performed by disabling all power management (except SpeedStep, if offered). The FM34XF3 ran for 2 hours and 20 minutes.

Yet, while the FM34XF3's performance and runtime were not great, they weren't terrible. Moreover, the price is reasonable, especially for the features that the FM34XF3 provides. In addition to a generous amount of RAM and a large

screen, our review unit was configured with an internal 56-Kbps fax modem and I/O/100BaseT Ethernet adapter, as well as a USB videocamera and software for video capture, video editing, and video e-mail creation. Its sub-\$2,000 price includes an attractive carrying case that's large enough for the laptop, videocamera, and other accessories.

If price is a major consideration, and you're not looking for the best possible performance from an 800-MHz laptop, FutureTech's FM34XF3 represents a decent value. However, if your applications will push the CPU to the limit, you may want to look elsewhere. One final note: Tech support hours are limited to East Coast business hours (9:00 a.m. to 7:00 p.m. Monday through Friday).



The ThinkPad A21m E1U embodies all of the features that have made the ThinkPad line popular. It provides a large, bright screen, comfortable keyboard, and the ability to work with almost all other ThinkPad peripherals, including the Ultrabase docking station and port replicator.

Powering the ThinkPad is an Intel Mobile Pentium III running at 700 MHz. This processor incorporates Intel's SpeedStep technology, which drops the operating voltage and clock speed when the laptop is running on battery power. In our testing, this enabled the ThinkPad A21m to achieve an impressive battery-rundown time. The CPU is incorporated on a motherboard that uses standard Intel 440BX core logic. The motherboard can accommodate 512MB of RAM, though our review unit came with a much more modest 64MB.

The machine has a three-spindle design, and weighs a comfortable 6.7 pounds. The hard disk is 10GB, not particularly large for a laptop in this price range. It's not very fast, either. Although it is an ATA/66 model, it spins at a leisurely 4,200 rpm. A standard 1.44MB floppy disk and 8X DVD-ROM drive occupy the other two spindles. The DVD-ROM drive is a modular unit, and can be replaced with

IBM ThinkPad A21m E1U

\$2,049

IBM Corp.

New Orchard Rd., Armonk, NY 10504; (800) IBM-4-YOU; www.ibm.com

Sales Channels: Direct, Retail, Resellers, VARs

CPU: 700-MHz Intel Pentium III

RAM/Expandable to: 64MB SDRAM/512MB

Drives: 10GB 4,200-rpm ATA/66 hard drive, 8X modular DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE MOBILITY-M 2X AGP video with 4MB of SDRAM

Audio: Crystal SoundFusion audio; integrated stereo speakers and microphone

Input: 89-key keyboard, TrackPoint pointing stick

Software: Windows 98, Lotus SmartSuite Millennium, PC Doctor

PC Card Slots: Two Type II or one Type III, CardBus and Zamed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, line-in, headphone, mic, FIR, USB, docking station

Size/Weight: 12.5 x 10.5 x 1.4 inches/6.7 pounds with battery installed

Battery/Battery Life: 3,800-mAh Li-Ion/4 hours 5 minutes achieved with power management disabled

Other: Kensington lock slot

Service and Support: Three-year parts and labor warranty, lifetime 24/7 toll-free tech support



Options: Hard drive (10GB, \$295; 20GB, \$539; 32GB, \$879), 4X4X20X CD-RW Ultrabay 2000 drive (\$389), Zip250 Ultrabay 2000 Drive (\$289), LS-120 Ultrabay 2000 drive (\$225), extra Li-Ion battery (\$165), battery charger (\$139), Ultrabay 2000 Li-Ion battery (\$189), docking station (\$499), port replicator (\$149)

Norton SI32 Score: 350.1

a weight-saver module, reducing the system's weight to 6.2 pounds.

The ThinkPad is a favorite laptop for presentations because of its great video

system. The screen is crisp and bright, and at 14.1 inches, it should be fine as an everyday desktop replacement.

The display is driven by the ATI RAGE

MOBILITY-M video chipset. This is a 2X AGP controller with 4MB of video RAM embedded in the chipset. The ATI chipset also provides hardware DVD acceleration and motion compensation. IBM includes Mediamatics DVDEExpress player. This combination provided excellent playback results on all of the DVDs we tested, including a badly scratched test disc that frequently shows hesitations. None of the DVDs we watched showed any hesitations, artifacts, or aliasing. One thing that the ThinkPad A21m E1U does lack, however, is S-Video or composite-video output. You won't be able to present to a large group on a TV, unless you buy a scan converter.

Audio is business oriented, and provided by a Cirrus Logic Crystal SoundFusion chipset. The speakers are small, but are

mounted at the top of the keyboard where they won't be muffled when you use the palm rests.

The 700-MHz Pentium III, while a moderately fast processor, is not the fastest Intel mobile CPU. The ThinkPad A21m E1U, however, offers ample performance for most users. Those with very demanding applications may want a laptop with more horsepower, and IBM offers ThinkPad A21 configurations with CPUs as fast as 850 MHz.

Another thing to consider is the amount of RAM in our review

unit, the basic 64MB. Adding RAM, especially in a system running Windows 98 or Me generally boosts performance. How much this affects you will largely depend on the apps you run.

IBM ThinkPad A21m E1U

PROS

- Good performance
- Excellent battery runtime
- Nice multimedia
- Strong warranty

CONS

- Only 64MB of RAM
- Smolish hard disk
- No dedicated Windows key

The ThinkPad A21m E1U excelled in battery runtime. The battery on our review system was a modest 3,800-mAh Li-Ion pack, but despite the large screen, the notebook ran for four hours and five minutes with all power-management features, other than SpeedStep, disabled. That's an outstanding runtime, long enough to work through the better part of a transcontinental trip.

We found little to dislike about the ThinkPad A21m E1U. The keyboard has no dedicated Windows key, though a one-touch key connects you to the ThinkPad Internet site. Considering its price, we found the 10GB hard drive and 64MB of RAM in the ThinkPad A21m E1U a bit skimpy. Neither is reason to overlook the ThinkPad A21m E1U. The price is not unreasonable. An excellent warranty is included, with three years coverage on both parts and labor. Tech support is toll free, and 24 hours every day. The ThinkPad A21m E1U is a good value if you are on a budget, but want a ThinkPad.

KDS, widely known for its consumer-level monitors, is quickly garnering a solid reputation for its Valiant model line of laptops. Providing laptops like the Valiant 6480iPTD configuration we received is the reason why. For less than \$1,900, the Valiant 6480iPTD provides a powerful processor, big screen, ample RAM, and a nice-sized hard disk. That's a lot of laptop for the money.

Powering the Valiant 6480iPTD is an 800-MHz Intel Pentium III. This is not the mobile version of the CPU. The desktop CPU uses the same .18-micron fabrication technology as the Mobile Pentium III, but does not incorporate SpeedStep technology to drop the core voltage and clock frequency when operating on battery power.

This CPU is mounted on a motherboard built around the Aladdin Pro II chipset, one of the newest core logic sets from Acer Labs. The core logic set supports up to 512MB of RAM, though our review unit had a more modest, though still quite generous, 128MB installed.

Although the Valiant 6480iPTD weighs in at just 6.8 pounds, it offers a three-spindle design that houses all

KDS Valiant 6480iPTD

\$1,899

KDS Computers, Inc.

7373 Hunt Ave., Garden Grove, CA 92841; (800) 533-7515; www.kdscomputers.com

Sales Channels: Retail, Resellers, VARs

CPU: 800-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 20GB 4,200-rpm ATA/33 hard drive, 8X DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; Trident Cyberblode Aladdin II 2X AGP video with 8MB of system RAM

Audio: ALi 1535 FM synthesis audio; integrated stereo speakers and microphone

Input: 87-key Windows keyboard, touchpad

Software: Windows Me

PC Card Slots: Two Type II or one Type III, CordBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, headphone, mic, FIR, two USB

Size/Weight: 12.2 x 10 x 1.5 inches/6.8 pounds with battery installed

Battery/Battery Life: 4,050-mAh Li-Ion/2 hours 50 minutes achieved with power management disabled



Other: Kensington lock slot

Service and Support: One-year parts and labor warranty, toll-free tech support 24/7

Options: NiMH battery (\$98), Li-Ion battery (\$174), car charger (\$89)

Norton SI32 Score: 380.1

three drives internally. The hard drive is a 20GB ATA/33 model, which provides a good amount of space. The floppy is a

standard 1.44MB unit, while the optical drive is an 8X DVD-ROM. Also included is an internal 56-Kbps fax modem; an

Ethernet adapter is optional.

As configured, the Valiant 6480iPTD can serve many roles. It is an excellent choice for presenting to small groups. It does not provide any video outputs beyond the standard VGA connector, so you'll need to purchase a scan converter to use the laptop with a large-screen television.

For most uses, the 14.1-inch screen will be just fine. It is sufficiently large to serve well in the office and in the air.

The display panel is driven by a Trident CyberBlade Ai1 chipset, which provides 2X AGP performance. The chipset uses 8MB of system memory as video RAM. This should not be a problem, considering that our test system contained 128MB of RAM.

The CyberBlade provided good video performance on all the applications we tried. Our test system included an 8X DVD-ROM drive, and KDS provided CyberLink's PowerDVD player utility,

although we had to install it ourselves. For the most part, we were very satisfied with the Valiant 6480iPTD's playback performance. We did experience some hesitations on our badly scratched test disc, but clean discs played flawlessly.

Audio is business quality. An ALI 1535 chipset provides FM synthesis sound, which will suffice for most users, especially if a set of external speakers is used.

There's nothing fancy about the Valiant 6480iPTD. It's a well-configured laptop at a nice price. The only downside to the 800-MHz Intel Pentium III desktop processor is the lack of SpeedStep technology. On the plus side, it gives the Valiant 6480iPTD a nice amount of "oomph." While 800 MHz is not Intel's fastest desktop processor, it drives this laptop to a very high level of performance.

The Valiant's 20GB hard disk is large enough to accommodate the most space-consuming files, and the system performs

nicely, even on processor-intensive jobs like rendering a large Photoshop file.

You might want to consider this notebook as your sole PC, since the 14.1-inch display is about as large as many of the less expensive flat-panel monitors sold for desktop use. We found the Valiant 6480iPTD's display nice and bright, a big plus if you need to stare at it hour after hour.

This notebook's battery runtime was not bad. The unit's Li-Ion battery has a 4,050-mAh capacity. It kept the Valiant 6480iPTD running for 2 hours and 50 minutes with all power management disabled.

The Valiant 6480iPTD does not have a port replicator or docking station connector. You can use a third-party offering, but this will occupy a USB port or PC Card slot. The video chipset uses some of the system memory, but with the 128MB of RAM in our review configuration, it didn't affect performance to any noticeable extent.

These criticisms are very minor. The good features, including a large, crisp display, generous hard disk, and plenty of RAM, far outweigh them, and make the Valiant 6480iPTD a very good value at the price.

KDS Valiant
6480iPTD

PROS

- Inexpensive
- DVD-ROM drive
- Good performance

CONS

- Uses o desktop CPU
- Video adapter uses system memory
- No port replicator or docking station connector

Max Computer Group Corp. (MGC), is not one of the most recognizable brand names when it comes to laptops. The vendor does, however, offer a variety of different products, including monitors, that are a bit better known.

For its laptop offering, MGC sent us a Max Note 6120, a fairly generic, but very nicely configured, higher end system. Weighing in at just under seven pounds (which makes it quite transportable when you have long walks between airport gates), the Max Note 6120 provides lots of power, a large screen, great multimedia, and a long battery runtime, all at a price that's very affordable—hundreds of dollars less than an equivalent system with one of the "big name" brand logos.

The Max Note 6120 is powered by a fast 850-MHz, Intel Pentium III processor. This is not a "mobile" CPU, which means that it lacks SpeedStep

Max Group Max Note 6120 \$1,999

Max Group Corp.

14 Audubon Rd., Wakefield, MA 01880; (800) 900-4629; www.mgc-boston.com

Sales Channels: Resellers, VARs

CPU: 850-MHz Intel Pentium III

RAM/Expandable to: 256M8 SDRAM/256M8

Drives: 12GB 4,700-rpm ATA/33 hard drive, 8X DVD-ROM drive, 1.44MB modular floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE PRO LT 2X AGP video with 8MB of SGRAM

Audio: Crystal SoundFusion audio; integrated stereo speakers and microphone

Input: 86-key Windows keyboard, touchpad

Software: Windows 98

PC Card Slots: Two Type II or one Type III, CordBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, line-out, mic, FIR, USB, docking station

Size/Weight: 12.2 x 10.1 x 1.5 inches/6.9 pounds with battery installed



Battery/Battery Life: 4,800-mAh Li-Ion/3 hours 15 minutes achieved with power management disabled

Other: Kensington lock slot, carrying case

Service and Support: One-year parts and labor warranty, lifetime toll-free tech support 9:00 a.m. to 9:00 p.m. M-F (EST)

Options: Port replicator (\$149), spare Li-Ion battery (\$179), car adapter (\$99)

Narten SI32 Score: 438.7

technology. The Max Note 6120's motherboard is also based around Intel technology, in this case the 440BX core logic chipset. The motherboard accommodates up to 256MB of RAM, and that's precisely how much MGC included in our review system. That's a lot of RAM to find in a laptop at this price, and is quite an attractive feature, especially if you run the Max Note 6120 on a network or have memory-intensive applications.

The hard disk, unfortunately, is not as generously sized, at 12GB. The Max Note 6120 has a true three-spindle design, the other two drives are a standard 1.44MB floppy disk drive and an 8X DVD-ROM drive. Also built-in is a 56-Kbps fax modem. A special connector is provided for a port replicator or docking station, and two Type II PC Card slots make it easy to add peripherals.

Very Nice Multimedia

Our Max Note 6120 review system had a 14.1-inch TFT LCD. This size is proving to be very popular in higher end laptops. That's because it provides a nice tradeoff between size, usability, and cost. For use as a desktop replacement, a 14.1-inch screen is large enough to look at for hours on end without significant eyestrain. For some types of applications, such as detailed graphics, you'll probably want to have a large high-quality CRT for backup, which can be simply plugged into the VGA port on the Max Note 6120's rear panel.

The Max Note 6120 is a terrific presentation machine. The 14.1-inch screen is large enough so that several people can easily see your presentation. Should you need to make this presentation to a larger group, there's an S-Video output connector that will let you use a large-screen television as

a presentation device.

Video quality is excellent, largely because of the use of an ATI RAGE LT PRO chipset to drive the LCD panel. The LT PRO is not the newest laptop chipset from ATI, but it delivers very nice performance. It is a 2X AGP controller and has 8MB of video RAM. The S-Video output is a feature of the RAGE LT PRO, as is motion compensation for full-

screen DVD playback. MPEG-2 decoding is performed in software, in this case the Mediamatics DVD Express player that's included. We tested a variety of DVD movies, including our badly scratched test disc, with no noticeable hesitations, aliasing, or artifacts.

Audio is also of good quality, though the Crystal SoundFusion chipset that the Max Note 6120 uses does not provide hardware wavetable sound. Unfortunately, the speakers are located in the palm rests, where they may be muffled by your hands while typing.

Excellent Performer

The major difference between the desktop and mobile versions of the Pentium III is that the Mobile PIII incorporates SpeedStep technology, which drops the

processor's clock rate and operating voltage when operating on battery power. This provides somewhat better battery life on a charge, as well as making the CPU run slightly cooler when on batteries.

The Max Note 6120 delivers exactly the same performance whether on battery or AC power—fast. On both formal benchmarks and real-world applications, the Max Note 6120 was one of the faster laptops that we've tested recently. That makes this particular model a good choice when you have multiple roles your laptop must serve. With its 14.1-inch display, the Max Note 6120 can handle arduous desktop chores, and will provide the same level of performance at 35,000 feet.

You'll be pleasantly surprised at just how long the Max Note will continue to deliver its performance in this mobile situation. While its runtime wasn't the longest we've seen, the hefty 4,800-mAh Li-Ion battery powered the Max Note 6120 for 3 hours and 15 minutes with all power management disabled. That's an excellent runtime considering how highly configured this laptop is and its lack of SpeedStep technology to extend battery runtime.

If you intend to use multiple USB devices with the Max Note 6120, be aware that it provides only a single USB port, so you may want to stock up on an inexpensive hub. Other than that caveat, we were highly impressed with MGC's Max Note 6120. It has a lot to offer, and is attractively priced.

Max Group Max
Note 6120

PROS

- Good performance
- Very good battery runtime
- Great multimedia
- Tons of RAM
- Good price

CONS

- Speaker grilles are located in palm rests
- Only one USB port

Laptop Processor Specs

Processing power isn't just the result of raw clock speed. Cache memory and the system bus also contribute to CPU performance. The following table lists the cache memory structures and bus speeds of the most common laptop processors.

Processor	Cache Structure	Bus Speed
Intel Celeron	32K L1, 128K on-die L2	66 or 100 MHz
Intel Pentium III	32K L1, 256K on-die L2	100 MHz
AMD K6-2+	64K L1, 128 on-die L2	95 or 100 MHz
AMD K6-III+	64K L1, 256K on-die L2, 512 to 1,024K onboard L3	95 or 100 MHz
Apple PowerPC G3 (PowerBook)	64K L1, 512 to 1,024K back-side L2	66 MHz
Apple PowerPC G3 (iBook)	64K L1, 512K back-side L2	66 MHz

Max Group doesn't sell notebooks directly to the public, but the company does distribute Max Group-branded machines through a number of channels, including local computer stores. We've been pleased with Max Group systems in the past, and the Max Note M7 speaks well for the company. A powerful slim/light notebook, the M7 packs considerable zip into its diminutive frame.

At just 3.5 pounds, the M7 is an extremely portable notebook. Although many buyers are attracted to the all-in-one convenience of a large three-spindle laptop, those who travel extensively with such a notebook may begin to regret it. At half the weight of many larger systems, the M7 disappears into a carry-on bag quite easily. Bringing the external drives will increase the weight and bulk somewhat, but many users won't need the optical and floppy drives on a regular basis (during a commute, for example).

The external CD-ROM drive connects to the M7 via a proprietary port on the right edge of the system. The drive's connecting cable is ridiculously short, providing little freedom of placement. The drive gets another demerit for not being hot swappable. You have to shut everything down in order to add or remove it, which can be irritating.

The floppy drive connects to a USB port. It has a longer tether and, like all USB devices, is hot swappable. We did notice some uncharacteristic behavior from the floppy (it apparently keeps track of the volume name in a way that a conventional floppy does not), but found it convenient and simple to use.

If you need to transfer a file to or from the computer and are stuck without the external drives, you can use the M7's other connectivity options. The notebook has integrated modem and Ethernet functionality, something we'd like to see in all business-class systems. Aside from being supremely convenient,

Max Group Max Note M7

\$1,999

Max Group Corp.

14 Audubon Rd., Wakefield, MA 01880; (800) 900-4629; www.maxgroup.com

Sales Channels: Retail, Resellers, VARs

CPU: 650-MHz Intel Pentium III

RAM/Expandable to: 192MB SDRAM/192MB

Drives: 12GB 4,200-rpm ATA/66 hard drive, 24X external CD-ROM drive, 1.44MB external USB floppy drive; one-spindle design

Video: 12.1-inch XGA active-matrix display; ATI RAGE MOBILITY video with 4MB of SDRAM

Audio: Crystal hardware wavetable audio; integrated microphone and mono speaker

Input: 83-key Windows keyboard, touchpad

Software: Windows 98

PC Card Slots: One Type II, CardBus and Zoomed Video enabled

Communications: Pctel 56-Kbps internal voice/fax modem, Realtek 10/100BaseT internal Ethernet adapter

Ports: VGA, headphone, mic, FIR, four USB, IEEE-1394, proprietary drive port

Size/Weight: 10.6 x 8.6 x 1.0 inches (with small battery)/3.5 pounds with small battery installed, 4.4 pounds with large battery installed



Battery/Battery Life: 1,400-mAh Li-Ion (small battery), 4,200-mAh Li-Ion (large battery)/1 hour 22 minutes (small battery), 4 hours 21 minutes (large battery) achieved with power management disabled

Other: Carrying case, Kensington lock slot

Service and Support: One-year parts and labor warranty, lifetime tech support 9:00 a.m. to 9:00 p.m. (EST) M-F

Options: 8X DVD-ROM drive (\$270), USB port replicator (\$149)

Norton SI32 Score: 330.1

integrated communications hardware frees the PC Card slots. Since the M7 has only one such slot (a common limitation in small systems), this is particularly important.

The M7 is equipped with four USB ports, which is two or three more than a typical laptop. Two ports are the standard full-sized type, while two are the smaller form factor more often found on portable devices like MP3 players. Max Group includes an adapter that allows a full-sized plug to be used with one of the mini-ports. For users with multiple USB peripherals, this plethora of ports could eliminate the need for a hub.

As if to show off how many ports the M7's designers

could squeeze into the system, the notebook also features an IEEE-1394 port. This is a high-speed interface (theoretically over 30 times faster than USB) that's commonly used for connecting digital video cameras to computers. Its

high-speed and bus-mastering technology (meaning it doesn't rely on the CPU) make it perfect for external storage as well. Because most 1394 devices can be daisy-chained, several peripherals can be simultaneously connected to the M7's one port.

Two Batteries Are Included

Our review unit included both a small battery that fits within the boundaries of the machine and an extended-life battery that protrudes from the back of the system. The small battery held out for 1 hour and 22 minutes in our rundown test—not impressive. The larger battery lasted a far more respectable 4 hours and 21 minutes. This battery adds substantial weight to the system, but is the only viable option for extended computing away from an outlet.

Although a 650-MHz processor isn't the fastest CPU around, the M7's Mobile Pentium III is more than up to the task of running typical applications. This is particularly so, given the PC's massive 192MB of system memory. This is more than the 128MB usually found on even high-end notebooks. Besides improving performance, extra RAM can also help

Max Group Max Note M7

PROS

- Crisp screen
- Four USB ports
- Integrated modem and Ethernet
- Large second battery included

CONS

- Short battery life with compact battery
- Loud fan
- Relatively short warranty period

lengthen battery life; more memory means the hard disk won't be accessed as much.

Putting a fast CPU in a small system can cause thermal strain due to heating from the processor. The M7's magnesium-alloy case helps combat this problem by dissipating heat more effectively than plastic. The magnesium also gives the system a very stylish look reminiscent of Sony's VAIO line. The whole system gets rather warm, and a heat-activated fan kicks on occasionally. The fan came on only a few times during our testing, but when it did, it was quite loud.

The M7 is equipped with a PCI version of ATI's popular RAGE MOBILITY chipset. The AGP version is more common, but the PCI interface didn't seem to hamper

performance much. In all notebooks, 3D acceleration is limited by the power-consumption requirements of the video chipset, and this is particularly the case in the smaller systems. Despite this, the MOBILITY chipset delivers plenty of performance for typical applications. The M7 has a VGA port for connecting an external monitor, and the chipset supports Windows Dual Display mode, so you can extend your desktop across the LCD and an external monitor.

The M7's LCD produces an exceptionally sharp image. This is because it packs the same number of pixels into its 12.1-inch screen as most 14.1-inch screens. The tightly spaced pixels are equivalent to having a very fine dot pitch in a CRT, which produces a sharp picture. The only drawback to a 12.1-inch XGA

screen is that some may find the print a bit small for comfort. If this is the case, you can always increase the font size in Windows.

The M7 is backed by an unexceptional one-year warranty. Technical support is available 12 hours a day on weekdays.

This is a solid, one-spindle system for those who place a high value on portability. Its XGA screen is sharp but small, as befits the system's overall compactness. Although running time with its standard battery is low, the larger battery keeps it going for the long haul (though it increases the notebook's weight significantly). The integrated communications hardware and IEEE-1394 port are attractive features. Overall, the M7 is a very strong contender among one-spindle notebooks.

We have to admire Micro Express. The company does almost no advertising, relying primarily on reviews such as this one, and word of mouth to promote sales. This unusual strategy seems to work well, as the company has survived and thrived while other, much more visible competitors have crashed and burned.

Products like the NP4800 have a lot to do with the company's success. For under \$2,000, you get a large 14.1-inch screen and a fast 800-MHz Mobile Intel Pentium III processor. This CPU is mounted in a motherboard based on Intel 440BX core logic. The motherboard can accommodate up to 512MB of RAM, though our review unit had a somewhat more modest 128MB of RAM installed. That's plenty for most typical users.

The NP4800 has a three-spindle design. The hard disk is a 12GB ATA/33 model, while the floppy disk drive is a standard 1.44MB. The optical drive is a 6X DVD-ROM drive. A 56-Kbps modem is contained internally.

Multimedia is important to home and business users alike, and the NP4800 does not disappoint in this respect. Micro Express makes laptops with larger screens, but for most users, the 14.1-inch display on the NP4800 will be fine, and costs a lot less. The screen is driven by the ATI

Micro Express NP4800

\$1,899

Micro Express

1811 Kaiser Ave., Irvine, CA 92614; (800) 989-9900; www.microexpress.net

Sales Channel: Direct

CPU: 800-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 12GB 4,200-rpm ATA/33 hard drive, 6X DVD-ROM drive, 1.44MB floppy disk drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE LT PRO 2X AGP video with 8MB of SGRAM

Audio: ESS Maestra 2E hardware wavetable audio; integrated stereo speakers and microphone

Input: 88-key Windows keyboard, touchpad

Software: Windows 98

PC Card Slots: One Type II, CordBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, line-in, headphone, mic, FIR, two USB, IEEE-1394, docking station

Size/Weight: 12.4 x 10.1 x 1.9 inches/7.6 pounds with battery installed



Battery/Battery Life: 4,500-mAh Li-Ion/2 hours 20 minutes achieved with power management disabled

Other: Kensington lock slot, carrying case

Service and Support: Two-year parts and labor warranty, 24/7 lifetime toll-free tech support

Options: Port replicator (\$149), network card (\$99), Kensington lock (\$39), car adapter (\$99)

Norton SI32 Score: 410.8

RAGE LT PRO chipset. This popular video controller provides 2X AGP performance and has 8MB of SGRAM for video memory. Hardware motion compensation is provided for full-screen DVD playback, but the actual MPEG-2 decoding is performed by the InterVideo WinDVD player software. Video performance

was excellent on all of the applications we tested, including DVDs. Even our badly scratched test disc showed no hesitations.

The audio system has the potential for excellence. The NP4800 has the same small speakers found in most laptops. They are well positioned at the top of the

keyboard where they won't be blocked by your hands while typing. The audio chipset is the ESS Maestro-2E, which provides hardware wavetable sound. Plug in a good set of external speakers and the sound quality is excellent.

The 800-MHz Mobile PIII processor is fast, so it came as no particular surprise to us that the NP4800 performed very well on both formal benchmarks and real-world

application testing. Though faster CPUs are available, the 800-MHz PIII is an excellent compromise between sheer speed and reasonable cost. Few applications will actually benefit from a slightly faster CPU, making the NP4800 a good choice as a desktop replacement. The

14.1-inch screen is sufficient for most typical office tasks.

For really detailed work, however, a CRT might be more appropriate. That's easy to attach, as is an optional port replicator. The NP4800 has only a single PS/2 port, but the USB port makes it easy to attach a full-sized keyboard and/or mouse.

The abundance of horsepower under the hood makes the NP4800 a good traveling companion. The S-Video output lets you easily display the laptop's output on a large-screen television or other video display with S-Video capability. For small groups, the NP4800's 14.1-inch screen will suffice.

The NP4800 uses the Mobile PIII, with

SpeedStep technology, but its performance on our battery-rundown test was less than impressive. With all power management (except for SpeedStep) disabled, the NP4800 ran for 2 hours and 20 minutes.

A Bit Hefty

One thing to keep in mind if you travel frequently is the NP4800's 7.6-pound weight. Although that's just a bit heavier than many other three-spindle laptops, every ounce counts when you find yourself dashing to make a connecting flight.

For the price, Micro Express's NP4800 offers a lot of power and usability. Micro Express products tend to be short on frills. The only software the NP4800 comes with is Windows 98, plus the utilities that you'll need for the DVD-ROM drive and modem. A nice carrying case is included. What you get for your money is a great mid-range laptop at a price that's very affordable.

Micro Express NP4800

PROS

- Very nice performance
- Excellent multimedia
- Good price

CONS

- Modest battery runtime
- Somewhat heavy

The Transport GX+ is micronpc.com's top-of-the-line desktop-replacement notebook. It's big, powerful, and feature laden. It's not for users who travel frequently with their laptops. For those who don't, it offers as much of the desktop experience as a laptop can.

The GX+ is equipped with a mammoth 15-inch LCD. This screen's native resolution is 1,400 x 1,050 pixels (SXGA+), considerably higher than the standard 1,024 x 768 found on most 14-inch displays. This means you have a huge desktop to play with and can keep multiple applications visible at the same time.

Our one complaint about the screen is its miserable scaling function. At an LCD's native resolution, each physical dot on the screen corresponds to a pixel in the image. At lower resolutions, the screen can either use only part of the LCD to display the image (resulting in a smaller image) or scale the image up to fill the entire screen.

The GX+'s display looks fine at 1,280 x 1,024 with scaling turned off. At any resolution below that, it looks atrocious with scaling on or off. The bottom edge of the image isn't displayed at all (so you can't access the Windows Start button)

Micron Transport GX+

\$3,668

micronpc.com

900 E. Karcher Rd., Nampa, ID 83687; (888) 208-1937; www.micronpc.com

Sales Channels: Direct

CPU: 850-MHz Intel Pentium III

RAM/Expendable to: 128M8 SDRAM/512M8

Drives: 20GB 4,200-rpm EIDE hard drive, 8X modular DVD-ROM drive, 1.44MB internal floppy drive; three-spindle design

Video: 15.1-inch SXGA+ active-matrix screen; S3 Savage/IX 2X AGP video with 16MB of SGRAM

Audio: ESS Maestro-2 hardware wavetable audio; integrated microphone and stereo speakers

Input: 87-key Windows keyboard, touchpad

Software: Windows 2000, Microsoft Office 2000 SBE, Symantec Norton AntiVirus

PC Card Slots: Two Type II or one Type III, CordBus and Zamed Video enabled

Communications: 3Com 56-Kbps fax modem/10/100BaseT Ethernet adapter Mini PCI card

Ports: Parallel, serial, PS/2, VGA, composite-video-out, line-in, headphone, mic, FIR, USB, docking station

Size/Weight: 12.8 x 10.7 x 1.6 inches/7 pounds with battery installed

Battery/Battery Life: 5,400-mAh Li-Ion/3 hours 10 minutes achieved with power management disabled



Service and Support: Three-year portable exchange warranty, 24/7 toll-free tech support for three years

Options: CD-RW drive (\$349), 30GB hard drive (\$400), auto/air adapter (\$80), second primary battery (\$119), port replicator with power supply (\$199), nylon carrying case (\$39)

Norton SI32 Score: NA

and the scaling is very rough. Most users will stay in SXGA+ mode, but if you plan to run the system at lower resolutions than SXGA, be warned.

The excellent LCD is driven by S3's Savage/IX chipset. This is one of the more powerful mobile chipsets currently in use, though it lags behind ATI's RAGE

MOBILITY 128 in 3D performance. Its 16MB of dedicated video memory lets the system run at its native resolution with 16-bit color. It also provides an edge in 3D performance, though the system struggles with demanding 3D games like *Quake III Arena* (the fact that it can run the game at all puts it above most laptops).

Our review unit was equipped with a 3Com modem/Ethernet adapter combo Mini PCI card. The system has full-sized ports that accept standard cables. This eliminates the need for PC Cards that often require dongles that can be broken or lost. Instead, the PC Card slots can be filled with a wireless network card or some other peripheral.

Included are rubber plugs to keep the modem and Ethernet ports free of debris when not in use, but we found them extremely annoying. It's an ordeal to pry the stubborn plugs from the ports, and when they're out you'll probably lose them, anyway. Most of the ports along the rear of the system are covered by a flip-down panel that has a tendency to open when you pick up the machine.

The Three Spindles

The GX+ carries a full load of drives. Our review unit was equipped with a spacious 20GB hard drive. This is large for a laptop, and provides room for a slew of applications and media files. The DVD-ROM drive is useful for playing movies and loading applications, and the floppy drive is always there, whether you need it or not. The three-spindle design contributes to the system's 7-pound heft, which is about average for a notebook this size. The GX+ is not highly mobile and is best suited for the occasional traveler.

The GX+ escapes anonymity by way of its silver exterior finish. It looks good, but it's not magnesium alloy. The plastic on the cover isn't rigid enough to keep the screen from discoloring when pressure is

applied to the lid. This means you should be especially careful about setting objects on top of the closed notebook, especially since it has a large screen. The body of the system feels quite solid, but the keyboard exhibits a lot of flex around the corners.

The touchpad is another story, with a rock-solid feel and very good tactile response. Between the usual "left" and "right" buttons are two smaller scroll buttons that many users will find handy.

In our battery-

rundown test, the GX+ held on for a little over three hours. Given the system's whopping screen, this is very respectable. The Transport GX+ is equipped with an 850-MHz Pentium III with SpeedStep Technology, reducing the operating frequency and voltage to conserve power (all other power management is disabled in our tests).

Our GX+ included MS Office 2000 SBE, which adds several hundred dollars to the price of the system. Culturally entrenched piracy causes many people to undervalue included software, but two systems cannot be fairly compared without taking software into account. The GX+ also includes Norton AntiVirus to keep the laptop free of malicious viruses.

The price of our review unit includes Micron's excellent portable exchange warranty. If the system has a hardware-related failure that doesn't involve the hard drive, Micron will send the user an identically configured system (even the asset tags will be the same). The user simply pops the loaded hard drive into the replacement system and sends the bad system back to Micron. If a technician needs to visit the user (to verify a problem and/or install the drive in the new system), the service call is usually made within 24 hours. Full-time telephone tech support is available for the duration of the warranty.

At nearly \$3,700, the Transport GX+ carries a plus-sized price tag. This is partly justified by the system's large

screen and rich features. However, it's really too expensive for most consumer shoppers. Corporate buyers, who are historically less price sensitive, will have fewer qualms about investing such sums in a laptop. The exceptional warranty should be of particular interest to business buyers that require quick turnarounds to avoid lost productivity. Users who need unusually high resolution in a laptop may also consider the GX+. The field of SXGA+ laptops is sparse, and micronpc.com is a respected name.

The Transport GX+ is an unusually powerful desktop-replacement notebook, and users willing to foot the hefty bill should be satisfied by it.

Micron

Transport GX+

PROS

- Exceptional warranty
- Ultra high-resolution screen
- Fast video chipset with 16MB of dedicated memory
- Fully integrated communications

CONS

- Expensive
- Mushy keyboard
- Inconvenient port covers

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NEC Versa VXi

\$2,348

NEC Computers Inc.

15 Business Pkwy., Sacramento, CA 95828; (888) 632-8701; www.neccomp.com



CPU: 600-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/256MB

Drives: 6GB 4,200-rpm EIDE hard drive, 24X CD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE MOBILITY-M 2X AGP video with 4MB of SDRAM

Audio: Yamaha AC-XG software wavetable audio; integrated stereo speakers and microphone

Input: 83-key Windows keyboard, touchpad

Software: Windows 98, LANDesk Client Manager, Symantec Norton AntiVirus

PC Card Slots: Two Type II or one Type III, CardBus and Zoomed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, composite-video-out, line-in, headphone, mic, FIR, two USB, docking station

Size/Weight: 12 x 9.8 x 1.6 inches/7 pounds with battery installed

Battery/Battery Life: 3,600-mAh Li-Ion/3 hours 50 minutes achieved with power management disabled

Other: Kensington lock slot

Service and Support: Three-year parts and one-year labor warranty, first-year onsite service, 24/7 toll-free tech support

Options: Verso port replicator with AC adapter (\$249), Li-Ion battery (\$229), Xircom 10/100BoseT Ethernet PC Card (\$159)

Norton SI32 Score: 262.3

The Versa VXi is an all-in-one, three-spindle system aimed at a user with modest needs who doesn't mind spending a little more for the NEC brand name and reputation. Our review configuration was powered by the 600-MHz version of Intel's Mobile Pentium III processor, which is at the low end of this CPU line. The motherboard uses the Intel 440BX core logic chipset. It can accommodate up to 256MB of RAM. Our review unit was loaded with a generous 128MB.

Much less generous, however, was the 6GB hard disk drive. This drive, a Hitachi DK23AA-60, uses the EIDE interface rather than the more current and much faster ATA/33 or ATA/66 interfaces. The optical drive is also fairly generic, a 24X CD-ROM that should prove satisfactory to its intended audience.

Also built in is a 56-Kbps fax modem. Our review configuration did not include a network adapter. NEC does, however, include a copy of Intel's LANDesk Client Manager network software.

NEC has always taken great pains to provide good performance in the video subsystem. The Versa VXi does very well in this regard. The screen on the Versa VXi is a large 14.1-inch model, and it's very bright, with an exceptionally crisp image.

NEC uses the ATI RAGE MOBILITY-M chipset to drive the display. This chipset provides 2X AGP performance, and has 4MB of SDRAM. The RAM is embedded, so it is very fast.

For use as a desktop replacement, the 14.1-inch screen provides a sharp image, so you shouldn't suffer eyestrain. As a presentation system, the screen is large enough to be viewed by a moderately large group. If you need to make a presentation to a larger group, the Versa VXi provides a composite-video-output jack, so you can use a suitably equipped large-screen TV as a display device.

Audio is business oriented, and is provided by an embedded PCI audio chipset. NEC uses Yamaha's AC-XG audio

CODEC to provide software wavetable sound. The speakers are located in the palm rests, but are ported out of grilles located in the Versa VXi's front panel. Overall audio quality is quite good, though not exceptional.

Running at a leisurely 600 MHz when powered by the AC line, and dropping down to 500 MHz when on batteries, the Versa VXi's performance could be charitably described as uninspired. The processor is at the lower end of Intel's Pentium III mobile lineup, and the Versa VXi is far from the fastest laptop we've tested that incorporates this particular processor.

Many of the potential purchasers of the Versa VXi are corporate users, whose major applications include spreadsheets and word processing, with an occasional PowerPoint presentation. None of these applications should particularly tax the capabilities of the Versa VXi. If, however, you try to render a large Photoshop image file, you'll have plenty of time to kick yourself for not choosing an 850-MHz system as you wait for the task to complete.

Another consideration is the size of the

hard drive. With the large amount of space that today's office suites take up, and the large number of files they generate, 6GB is a small hard drive. The fact that this drive uses the older EIDE interface and spins at a leisurely 4,200-rpm does nothing to boost the Versa VXi's overall performance.

Strong Battery Life

The one performance area where the Versa VXi stands out is the one that you really appreciate in a laptop—the battery-runtime. The battery pack is relatively modest, a 3,600-mAh Li-Ion model. It does the job quite nicely, however. With all power management, except for SpeedStep, disabled, the Versa VXi ran for 3 hours and 50 minutes. That's very impressive. Most users will set some modest power management in place, in which case runtimes of more than four hours should be possible.

The Versa VXi works well, though it's no powerhouse. It is somewhat expensive. There are plenty of corporate purchasers who have been very pleased over the years by the laptops this vendor has delivered. These users won't find the Versa VXi the slightest bit disappointing. If you are looking for the most bang for the buck, however, you may want to keep looking.

NEC Versa VXi

PROS

- Excellent video
- Very good battery runtime
- Strong warranty

CONS

- Mediocre performance
- Relatively expensive
- Small hard disk

PC Club's laptops are generally high-end configurations, as was the ENP-325@Mobile unit we received for review. It has one of the largest screens you can currently find. A fast 850-MHz Intel Mobile Pentium III processor is mounted on a motherboard that uses standard Intel 440BX core logic and can accommodate up to 512MB of RAM. Our review unit had a more modest 128MB.

The ENP-325@Mobile has a three-spindle design, with all three drives contained internally. The floppy is a standard 1.44MB model, while the optical drive is an 8X DVD-ROM. The ENP-325@Mobile's hard disk is a fast ATA/66 model that offers 10GB of storage capacity.

The laptop's lid overhangs the bottom half slightly on three sides. This allows for the larger screen without an excessive weight penalty, though the system's 7.4-pound heft will be noteworthy to frequent travelers.

Great Multimedia

One nice thing about a laptop with a screen this large is that you can use it for just about any task. Consider that a similarly sized flat-panel display for a desktop PC is a popular option. Using the ENP-325@Mobile as a desktop replacement will give you the same amount of screen real estate, though the keyboard is noticeably smaller than a standard desktop keyboard.

When traveling, the large screen makes giving a presentation in front of a moderately large group a breeze. The ENP-325@Mobile has an S-Video connector, so you can show the laptop's display on any large-screen television or monitor that's equipped for S-Video input.

Driving the large screen is an ATI RAGE MOBILITY 128 video controller with 16MB of video RAM. That's considerably more dedicated video memory than most laptops sport these days, and the results are apparent. Video performance was simply excellent on

PC Club ENP-325@Mobile

\$2,449

PC Club

18537 E. Gale Ave. #B, City of Industry, CA 91748; (800) 997-2258; www.pcclub.com

Sales Channels: Direct, Retail, VARs

CPU: 850-MHz Intel Pentium III

RAM/Expendable to: 128MB SDRAM/512MB

Drives: 10GB 4,200-rpm ATA/66 hard drive, 8X DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 15.1-inch XGA active-matrix display; ATI RAGE MOBILITY 128 2X AGP video with 16MB of SGRAM

Audio: ESS Maestro-2E hardware wavetable audio; integrated stereo speakers and microphone

Input: 87-key Windows keyboard, touchpad

Software: Windows Me

PC Card Slots: Two Type II or one Type III, CardBus and Zamed Video enabled

Communications: 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, line-in, headphone, mic, FIR, USB, docking station

Size/Weight: 12.8 x 10.2 x 1.6 inches/7.4 pounds with battery installed



Battery/Battery Life: 5,400-mAh Li-Ion/3 hours 25 minutes achieved with power management disabled

Other: Kensington lock slot, carrying case

Service and Support: One-year parts and labor warranty, toll-free tech support 8:00 a.m. to 7:00 p.m. M-F, 10:00 a.m. to 2:00 p.m. Sat. (PST)

Options: Port replicator with 100BaseT Ethernet (\$199), upgrade to 20GB hard disk (\$99), upgrade to 256MB of RAM (\$109), car adapter (\$29)

Norton SI32 Score: 360.8

all of the applications that we tested, including several games.

The video chipset provides hardware DVD acceleration and motion compensation for full-screen playback, though actual MPEG-2 decoding is performed in the player utility. PC Club included the excellent Mediamatics DVDEExpress player for this purpose. All of the DVDs we tested, including our badly scratched test disc, played perfectly on the ENP-325@Mobile.

The ENP-325@Mobile's audio capabilities are likewise very nice. The laptop uses the ESS Maestro-2E audio chipset

to provide hardware wavetable sound.

The speakers in the ENP-325@Mobile are typical small laptop fare, which limits both the volume and quality of their sound. These speakers are located in the palm rests, but are ported out of the sides of the laptop so your hands won't muffle them when typing. Plug in a good set of external speakers, and you'll be very pleased with the audio quality.

PC Club ENP-325@Mobile

PROS

- Giant screen
- Excellent multimedia
- Good battery runtime
- Good price

CONS

- Smallish hard disk
- Modest performance
- Only one USB port

disabled, the ENP-325@Mobile ran for 3 hours and 35 minutes. That's quite good. The SpeedStep technology in this particular CPU drops the clock speed from 850 MHz to 700 MHz when operating on battery power, so even when operating away from AC power lines, the ENP-325@Mobile will perform well.

There are some laptop vendors we don't hear a lot about. Big-name companies like Dell and IBM frequently steal the spotlight, but some little-known companies produce worthy systems and sell them for a good bit less than the name-brand companies. ProStar knows more than how to create a competent portable. This company makes notebooks with aplomb, investing lots of attention in detail on each of its systems. The ProStar 2893 is a great example of this company's excellence.

The ProStar 2893 falls squarely in the middle of the ProStar family lineup. The 2893, for instance, is a ten-pound notebook, too large for road warriors and best suited as a desktop replacement.

The 3593 is a multimedia powerhouse. It's more laptop than most users need, equipped with 1394 and video-out ports. It has a smart combination of essentials for business travelers—three spindles, a full array of ports, long battery life, and a reasonable weight of less than seven pounds. At nearly \$2,700, its cost is significant, but you get a fully packed, fully charged system that's well worth the cost.

The 2893 has a large footprint, measuring 12.8 x 10.5 inches. The keyboard is roomy and comfortable for touch typists, and it hasn't even a hint of flex. We typed long documents—including this review—on the 2893 and never felt fatigued. The touchpad is slightly larger than most, measuring almost three inches on the diagonal. It sports a pair of oversized curved mouse buttons. Since the touchpad itself is slightly recessed and offset from the notebook's centerline, it's less susceptible to accidental cursor movement while typing.

The system has a sturdy look and feel. Powered by Intel's 850-MHz Mobile Pentium III processor, the system

The ENP-325@Mobile comes with a 56-Kbps fax modem contained internally.

One criticism we have is that the ENP-325@Mobile has only a single USB port. It does, however, offer a connector for a docking station or port replicator. If you decide to use this machine as a desktop replacement and want to use a variety

of USB peripherals, such as a keyboard, mouse, and printer, you may want to purchase a port replicator or a USB hub. The port replicator that PC Club offers for this unit has a 100BaseT LAN adapter.

Other than that small criticism, we found the ENP-325@Mobile a nicely configured and affordable laptop.

ProStar 2893

\$2,675

ProStar Computer, Inc.

1128 Coiner Ct., City of Industry, CA 91748; (800) 576-3269; www.2001prostar.com

Sales Channel: Direct

CPU: 850-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 20GB 4,200-rpm ATA/66 hard drive, 8X DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 15-inch XGA active-matrix display; ATI RAGE LT PRO 2X AGP video with 8MB of SGRAM

Audio: Yamaha DS-XG software wavetable audio; integrated stereo speakers and microphone

Input: 84-key Windows keyboard, touchpad

Software: Windows Me, InterVideo WinDVD

PC Card Slots: One Type II, CardBus and Zamed Video enabled

Communications: 56-Kbps internal fax modem, 10/100BaseT internal Ethernet adapter

Ports: Parallel, serial, PS/2, VGA, line-in, headphone, mic, FIR, two USB

Size/Weight: 12.8 x 10.5 x 1.7 inches/6.9 pounds with battery installed



Battery/Battery Life: 3,000-mAh Li-Ion/3 hours 20 minutes achieved with power management disabled

Service and Support: Four-year parts and labor warranty, lifetime toll-free tech support 7:30 a.m. to 6:00 p.m. (PST) M-F, 9:00 a.m. to 3:00 p.m. Sat.

Options: None

Norton SI32 Score: 433.4

performed very well in day-to-day tasks. It's fast and responsive, updates screen displays lightning fast, and, overall, seemed to perform every bit as well as similarly equipped desktops.

The processor is equipped with SpeedStep, a feature that toggles the CPU's horsepower, depending upon whether it's connected to AC power or running on its battery. When running on battery power, the processor steps down in clock speed, saving power and extending battery life. Subjectively, it was difficult to tell whether the processor was running at full or limited capacity.

Memory is an important component in a notebook's overall performance. The 2893 is equipped with 128MB of SDRAM, which is an excellent configuration for business and entertainment applications, especially if you expect to run several

programs at once. The laptop can be upgraded to as much as 512MB of RAM.

The 2893 is a full-featured, three-spindle PC. The hard disk is powered by an ATA/66 controller spinning at 4,200 rpm. Its 20GB capacity should be more than sufficient for the vast majority of users. The only bundled software is Windows Me and a DVD player. That leaves a lot of hard disk available for application and data storage.

In addition to the spacious hard disk, ProStar includes a permanently mounted floppy disk drive and an 8X DVD-ROM drive. If desired, the system can be downgraded to a 24X CD-ROM drive. We recommend sticking with the DVD-ROM drive, though, especially if you envision watching movies on long flights. The DVD-ROM drive is mounted in a modular media bay, meaning it can be swapped for other

components easily and quickly.

Almost any audio and video chips would be adequate for word processors and spreadsheets, but ProStar designed the 2893 with a little entertainment in mind as well. The highlight of the multimedia subsystem is an ATI RAGE LT PRO chipset, which provides excellent 2D and 3D video acceleration. Equipped with 8MB of SGRAM, the ProStar can play many current game titles and run the LCD display at 32-bit color depths.

Beautiful Display

The LCD is one of the system's best features. The huge, 15.1-inch screen is bright from edge to edge and as sharp as we've seen in a laptop. That large screen is the main reason for the system's overall dimensions, as the bottom of the case flanges out about half an inch along three sides to meet it. The additional size is well justified, though it could be a problem in cramped airline seats, where using a

huge screen is a liability.

As for sound, the ProStar is equipped with a Yamaha audio chipset and a pair of medium-sized speakers. Sound is solid (though somewhat trebly), and since the speakers are mounted near the top of the case, above the keyboard, your hands won't ever muffle them.

The system weighs slightly less than seven pounds, and that might be a liability if you travel frequently. However,

given what this system offers—three spindles and a huge display, for example—it is well worth the extra weight. The Li-Ion battery proves itself on the road, running for 3 hours and 20 minutes with power-management features disabled.

There is an abundance of ports on the 2893, and they're all well protected from the elements. It's this attention to detail that makes the ProStar look like a winner. The two USB ports are protected by rubber inserts, for instance, while audio jacks are hidden on the front of the case behind a sliding door. In back, the parallel and serial ports have a flip-down door, and the VGA port has its own flip-down cover. With so

many discrete covers for these ports, you can protect most of the unused inputs even when some ports are actively in use.

There's more in the box, as well. The ProStar 2893 comes with an integrated 10/100BaseT Ethernet adapter and a 56-Kbps modem, and includes a vinyl carrying case. The case won't win any fashion awards, but it's adequate.

ProStar's intangibles make it an excellent value. The company offers an expansive four-year parts and labor warranty (through Phillips Magnavox), which is significantly longer than most vendors provide. Technical support is available for the life of the laptop. The hours are not 24/7, but ProStar should nonetheless be applauded for such a comprehensive support policy.

The ProStar 2893 is a superb notebook with few blemishes and its cost reflects that. From top to bottom, though, it's a great PC. The aluminum-colored finish is attractive and professional. The system has excellent horsepower, and it's a good, all-around notebook that balances features, size, and weight. If you travel frequently, this notebook may simply be too big. For the average user, however, the ProStar 2893 is the Holy Grail of laptops.

ProStar 2893

PROS

- Powerful processing
- Three-spindle design
- Great 15-inch display

CONS

- Relatively heavy
- A bit costly

Sceptre shows off a genre-defining system with its new desktop-replacement notebook, the S69502. It puts a fistful of power in a solidly constructed laptop.

The first thing we noticed about the S69502 is its large 15.1-inch display. Even when turned off, its size is impressive. When we fired up the system, we were surprised to discover that the LCD has a native resolution of 1,400 x 1,050 (SXGA+). This is considerably higher than the 1,024 x 768 (XGA) resolution typically found in laptop displays. In fact, it's higher than many desktops comfortably handle.

The S69502 can display resolutions lower than SXGA+, but LCDs never look very good when run outside of their native resolutions, so for most purposes the S69502 functions best at SXGA+. The screen overhangs the edge of the laptop's body when it's closed, but the larger

Sceptre S69502

\$2,599

Sceptre Technologies

16800 E. Gale Ave., City of Industry, CA 91745; (800) 788-2878; www.sceptre.com

Sales Channels: Direct, Resellers, VARs

CPU: 800-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/512MB

Drives: 12GB 4,200-rpm ATA/33 hard drive, BX modular DVD-ROM drive, 1.44MB internal floppy drive; three-spindle design

Video: 15.1-inch SXGA+ active-matrix display; ATI RAGE MOBILITY 128 2X AGP video with 16MB of SDRAM

Audio: ESS Moestro-2E hardware wavetable audio; integrated microphone and stereo speakers

Input: 87-key Windows keyboard, touchpad

Software: Windows Me

PC Card Slots: Two Type II or one Type III, CardBus enabled

Communications: Lucent 56-Kbps Mini PCI fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, line-in, headphone, mic, FIRE, USB, docking station

Size/Weight: 12.8 x 10.2 x 1.7 inches/7.6 pounds with battery installed



Battery/Battery Life: 5,400-mAh Li-Ion/3 hours 23 minutes achieved with power management disabled

Service and Support: One-year parts and labor warranty, lifetime toll-free tech support 8:30 a.m. to 5:30 p.m. (PST) M-F

Options: Secondary battery (\$119), docking station with 10/100BaseT Ethernet (\$229)

Norton SI32 Score: 403.1

footprint will be worth it to those who crave lots of room on the Windows desktop.

With its huge screen, this is not a small laptop. Weighing in at 7.6 pounds, it's not exactly light, either. The hard fact remains that, barring a truly revolutionary development in building materials, large laptops will always be heavier than what the average person would like to lug around. If you include accessories like the AC adapter, the total weight of the system rises to over eight pounds. For people who travel frequently, this is usually too much; such users are generally better served by a slim/light system. That said, the S69502 is very well suited for users who need a powerful notebook and who travel relatively infrequently.

Three-Spindle Design

With all three drives internally mounted, the system is a convenient all-in-one unit, unlike laptops that minimize weight and size by moving some drives outside the system. The floppy drive is integrated, while the DVD-ROM drive is modular so it can be swapped with other peripherals.

Our review unit was equipped with an 800-MHz Mobile Pentium III processor. It wasn't long ago that desktop CPUs topped out at 800 MHz, and that's still a formidable speed, well-suited for heavy processing like spreadsheet or imaging work.

Boasting Intel's SpeedStep technology, the chip can conserve power when running on battery power with a relatively small impact on performance. The system lasted a strong 3 hours and 23 minutes in our battery-rundown test. However, we had to suffer through the most startling and obnoxious low-battery alarm ever devised. This alarm cannot be disabled in the Windows Control Panel or through the BIOS—the only way to silence it is to mute all sounds in Windows.

With the S69502's magnificent screen, it's natural to expect that the system packs powerful video support to go with it. The notebook is equipped with ATI's RAGE MOBILITY I28 chipset, one of the fastest mobile video adapters available. Coupled with an impressive 16MB of SGRAM, this is one of the few mobile video solutions capable of the kind of 3D acceleration that lets you play demanding games.

For all you *Quake* 3 fans out there who cringe when you're away from the desktop, your salvation has arrived. We were able to play the game at 1,024 x 768 with good

results. You'll probably want to bring a mouse along, because using the touchpad for such a game is very difficult.

As frosting on the cake, the system has an S-Video output that can be connected to a television for watching DVDs on the big screen. For some reason, Sceptre doesn't include DVD-playing software with the S69502. Some DVD-ROMs include software players right on the disc, but to play older titles you'll have to acquire your own player.

The RAGE MOBILITY I28 supports Windows' Dual Display mode, so you can extend the desktop across the LCD and an external monitor. Because of the system's large complement of video memory, both screens can be run at high resolutions while displaying independent images.

The S69502 is solidly constructed. The base is very rigid, which is impressive in such a large notebook. Pressing on the back of the lid does produce some discoloration in the LCD, so care should be taken not to place heavy objects on top of the closed notebook. The system could benefit from a magnesium-alloy display backing, but this would add to the construction costs.

The styling is Spartan, with a black color scheme and simple, hard angles. This notebook has a serious business presence, though it's priced within the consumer range.

The keyboard exhibits some flex, but tactile response is good. The touchpad and its buttons are large, and the buttons have a precise feel that we appreciated. There is a push-button volume control on the left panel.

A Mini PCI modem with a full-sized phone jack is also located on the left panel. Sceptre offers a docking station with Ethernet support, but we would have liked a modem/Ethernet combo Mini PCI card in the S69502 since the system is otherwise such an excellent choice for business use.

Sceptre backs the system with a slightly anemic one-year warranty and business-hours tech support. In Sceptre's own words, the S69502 is a "mobile desktop." We'd emphasize the "desktop" part of the description, since its weight and size limit its mobility. However, the system's performance, particularly its 3D video acceleration, is excellent. The S69502 is a strong candidate for users who need a lot of power in a notebook and don't put a premium on low weight.

Sceptre S69502

PROS

- Extremely high-resolution display
- Blozing graphics performance
- Solid look and feel

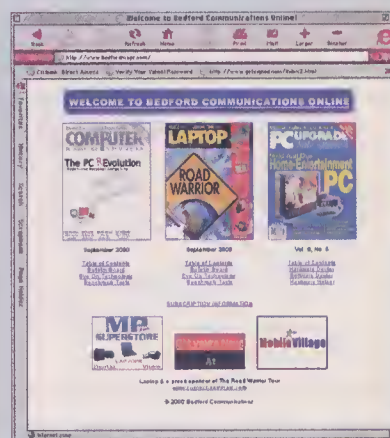
CONS

- No software DVD movie player included
- Short warranty; tech support isn't 24/7

VISIT



ONLINE



www.bedfordmags.com

One thing is for sure about Toshiba's Satellite line of laptops: it's unique. In a world full of cookie-cutter clones, the Satellite stands out for a number of reasons. How these idiosyncrasies sit with you will determine whether or not the notebook is for you.

The Satellite's looks alone differentiate it from the competition. Closed, the system presents a handsome navy and silver profile, with sweeping curves that serve to streamline what is actually a rather large machine. On the inside, the blue/silver color scheme is continued, with gray accents added by the keyboard. The system doesn't quite achieve the sleekness of a slim-line magnesium-alloy notebook, but it looks great all the same.

Toshiba pushes the limits of "desktop replacement" by cramming a truly enormous keyboard into this notebook. The tactile response is great, but the layout is unconventional. The keyboard's center (based on the spacebar) is actually skewed to the left, like a full-sized desktop keyboard. This takes some getting used to, as does the unusual layout (the Tab key is the size of a standard alphanumeric key and the right Shift key is stunted, among other things). If you can get used to the strange layout, the Satellite's keyboard provides a very desktop-like experience.

Not content to merely have a nonstandard keyboard, Toshiba also abandons the tried and true left/right buttons for the pointing stick. Instead, the buttons are top/bottom ("top" is "left"). Like the keyboard, this takes some getting used to, but we didn't mind it much. There are two small left/right buttons that scroll through apps and are very convenient. The pointing stick is, itself, an anomaly in these touchpad-dominated times, but Toshiba's is well designed and highly responsive.

The Satellite is certainly a desktop replacement. Our review unit, a 2805-S301, loomed imposingly on the test bench. It could easily accommodate a 15-inch LCD, though ours was equipped with a

Toshiba Satellite 2805-S301

\$1,799

Toshiba America Information Systems, Inc.
9740 Irvine Blvd., Irvine, CA 92618; (800) TOSHIBA; www.buy.toshiba.com

Sales Channel: Retail

CPU: 650-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/384MB

Drives: 10GB 4,200-rpm EIDE hard drive, 8X DVD-ROM drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; S3 Savage/IX 2X AGP video with 8MB of SGRAM

Audio: Yamaha PCI YMF754B-R software wavetable audio; integrated microphone and stereo speakers with subwoofer

Input: 85-key Windows keyboard, AccuPoint II pointing stick

Software: Windows Me, Lotus SmartSuite Millennium, Toshiba Great Software Offer

PC Card Slots: Two Type II or one Type III, CardBus enabled

Communications: 56-Kbps fax modem/Intel 10/100BaseT Ethernet adapter Mini PCI card

Ports: Parallel, PS/2, VGA, video/audio out (with included adapter), headphone, mic, two USB



Size/Weight: 12.9 x 10.7 x 1.5 inches/7.3 pounds with battery installed

Battery/Battery Life: 4,000-mAh Li-Ion/2 hours 45 minutes achieved with power management disabled

Service and Support: One-year parts and labor warranty, one-year 24/7 toll free tech support

Options: None

Norton SI32 Score: 340.1

more economical 14.1-inch screen. At 7.3 pounds, the Satellite exerts significant pull on your shoulder. It's definitely not for the everyday traveler. The three-spindle layout puts all-in-one convenience over compactness and low weight.

Although the 2805-S301 has two PC Card slots, you won't need either one for standard communications functions.

The system has an integrated modem and Ethernet adapter. These full-sized jacks are located on the rear panel.

Toshiba includes a generous software bundle with this PC. Lotus SmartSuite provides all the productivity features most users will need. Symantec's Norton AntiVirus protects

the laptop from infection.

The VirtualTech utility provides integrated support, repairing damaged applications by taking "snapshots" of key files while the application is working, and reverting to those working copies when a problem arises. This must be enabled

ahead of time; the system snapshot is taken at the start of a program's installation. VirtualTech provides a gateway through which technical support can gain access to the notebook via an Internet connection in order to diagnose and fix problems.

The notebook is equipped with S3's Savage/IX video chipset. Coupled with 8MB of RAM, this video solution provides more than enough power for everyday use. Despite the fact that the Savage/IX is faster than many notebook video solutions, it's not powerful enough for 3D gaming (especially when paired with 8MB rather than 16MB of memory). The 2805-S301 can be connected to a television via its included multimedia adapter, which turns a single 1/8-inch jack on the side of the laptop into a composite-video and stereo-audio output.

A Yamaha chipset takes care of audio for the 2805-S301. Toshiba takes an innovative approach to the system's speakers. In addition to the two positioned below the screen, there's a "subwoofer" that is mounted on the underside of the unit. About 1.5 inches in diameter, this may well be the smallest driver ever to be called a subwoofer. While we applaud Toshiba's attempt to spice up the world of notebook audio, we can't get too excited about this

Toshiba Satellite 2805-S301

PROS

- Interesting, unconventional design
- Fully integrated communications
- Good value
- External audio controls

CONS

- Not very portable
- Nonstandard keyboard
- Sticky switch

sub. The system sounds like any other laptop with a decent set of speakers: tinny and weak.

In keeping with the system's audio theme, Toshiba includes hardware controls for the audio player. You can stop, play, and skip tracks using the silver buttons on the laptop's hinge. They are cleverly positioned to be accessible even when the notebook is closed.

We encountered one glitch with our review unit. The tiny switch that tells the laptop whether the screen is open or closed often stuck in its hole when the laptop was opened. This prevented the notebook from turning on. Simply

jostling the peg slightly fixed the problem, but we had to do this about half the times we opened the system.

Toshiba includes a utility that extends the functionality of Windows' power management, allowing for fine-tuning system performance and power conservation tradeoffs. Screen brightness, CPU speed, the timing for hard disk spin-down, and other factors can be controlled independently for each quarter of the battery's life. For example, the screen can be set to run at full brightness for the first quarter but to dim for the last quarter. With all parameters set for maximum performance, the system lasted 2 hours

and 45 minutes in our rundown test. This is fine, but not spectacular. Impressively, the conservation software accurately predicted how long the laptop would last.

The Satellite 2805-S301 is a unique laptop. Its nonstandard keyboard and pointing device may not sit well with everyone, but it does approximate a desktop very effectively. The system's price is competitive, especially considering Toshiba's tightly integrated software package, which adds significant value. For those looking for a desktop replacement who are willing to stray a bit off the beaten path, the 2805-S301 offers a nice option.

Like other WinBook desktop-replacement notebooks we have reviewed, the Si 850 deserves praise. It's a solid laptop, sturdily constructed and tightly integrated. The "850" refers to the system's 850-MHz Pentium III processor. This is fairly fast even by desktop standards and should provide plenty of power for CPU-intensive applications, like processing large spreadsheets. Until AMD's mobile Athlon is released, the PIII is the only game in town for high-end mobile computing.

The Si 850's CPU is a desktop processor, not a Mobile Pentium III with SpeedStep technology. It therefore doesn't throttle back when running on battery power. This is probably why the battery lasted only 2 hours and 20 minutes in our rundown test.

The Si 850 doesn't deviate from WinBook's traditional black-on-black styling, making it less flashy than today's fashionable magnesium-clad machines. With the screen closed, the system looks like a featureless black slab. However, witness the tuxedo, basic black will never go out of style. The notebook's uncluttered appearance is well suited for a conservative business setting.

Three-Spindle Design

The Si 850 is a three-spindle system, so all of its drives are mounted internally at the same time. This is a convenient

WinBook Si 850

\$2,399

WinBook Corp.

1100 Steelwood Rd., Columbus, OH 43212; (800) 965-5287; www.winbook.com

Sales Channels: Direct, Retail

CPU: 850-MHz Intel Pentium III

RAM/Expandable to: 128MB SDRAM/256MB

Drives: 20GB 4,200-rpm ATA/33 hard drive, 4X4X20X CD-RW drive, 1.44MB floppy drive; three-spindle design

Video: 14.1-inch XGA active-matrix display; ATI RAGE MOBILITY-M 2X AGP video with 4MB of SDRAM

Audio: ESS Sala-1 hardware wavetable audio; integrated stereo speakers

Input: 87-key Windows keyboard, touchpad

Software: Windows Me

PC Card Slots: Two Type II or one Type III, CardBus and Zamed Video enabled

Communications: Lucent 56-Kbps internal fax modem

Ports: Parallel, serial, PS/2, VGA, S-Video-out, line-in, headphone, mic, FIR, two USB, docking station

Size/Weight: 12.2 x 9.6 x 1.6 inches/7.1 pounds with battery installed

Battery/Battery Life: 3,000-mAh Li-Ion/2 hours 20 minutes achieved with power management disabled



Service and Support: One-year parts and labor warranty; toll-free tech support 8:00 a.m. to 9:00 p.m. (EST) M-F, 9:00 a.m. to 4:00 p.m. Sat.

Options: Part replicator (\$99), auxiliary Li-Ion battery (\$199), auto/plane AC adapter (\$79), notebook backpack (\$59); three-year Premium Care warranty, with Priority Overnight shipping and delivery (\$99)

Norton SI32 Score: 420.1

design for a system that will spend most of its life on a desk rather than on the road. However, it results in a notebook that is larger and heavier than machines with one or two spindles. For the desktop-replacement market, this is a worthwhile sacrifice for the convenience and power offered by the larger systems. However, if you travel often, carrying a seven-pound weight in your bag (more with accessories like the power adapter)

can quickly become a burden.

The Si 850's floppy drive is integrated into the notebook. The 20GB hard disk provides plenty of room for a host of applications with space left over for MP3s or other media files. The Si 850's most unusual feature is a CD-RW drive, placed next to the floppy. CD-RW drives are becoming increasingly common on desktops, but have been slower to penetrate the laptop market. This is

probably due to a combination of high price and the fact that the CD-RW displaces the popular DVD-ROM drive option.

We believe that more people benefit from CD-RW functionality than from the ability to watch movies. The CD-R provides an inexpensive way to distribute large files among friends or archive information. Nearly all CD-ROM drives can

read CD-R and CD-RW discs, so compatibility is rarely an issue. CD-RWs can be used as giant floppy disks to move files between non-networked computers. WinBook includes Adaptec's Easy CD Creator software to simplify the writing process.

The Si 850 exudes a durable feel that we like in a notebook. While many laptop keyboards flex when you type on them, the Si 850's is as stable as granite. This makes the keyboard's tactile response more satisfying. The entire system is quite rigid, though we could produce some discoloration in the LCD by pressing on the lid of the laptop behind the screen. This

suggests that you shouldn't stack heavy objects on top of the notebook—good advice for any system. No switches or ports protrude from the edges, minimizing

the chance that a snag will cause damage. The audio jacks are sensibly located in front (along with a volume control), and two USB ports lie on the left side for peripherals.

The usual two PC Card slots are on the PC's right edge. The Si 850 is equipped with an internal

modem, so you don't need to worry about an extra PC Card device. With a full-sized phone jack on the laptop, you eliminate the chance of snapping off a protruding connector or dongle.

Nice Display

The laptop features a 14.1-inch LCD, which is the standard size for desktop-replacement systems. The screen produces a sharp image, and we noticed no dead pixels on our unit. The LCD is mated with ATI's popular RAGE MOBILITY-M video chipset. In this implementation, the MOBILITY-M is given 4MB of dedicated

memory rather than the 8MB that is more common at this price. This may explain why the 3D performance was not quite as good as we typically see with this chipset. This shouldn't matter to most users, since 3D is not a big selling point for notebooks.

Like the great majority of laptop video solutions, the MOBILITY-M chipset has nowhere near the power of desktop chipsets. It does allow the LCD and an external monitor to be in use simultaneously, with different images on each one. The Si 850 also features an S-Video output for directing video to a television set.

WinBook backs the Si 850 with a one-year parts and labor warranty. Technical support is not available 24/7, but the hours are extensive, especially for East Coast customers. An optional three-year Premium Care warranty is available for \$99, and includes FedEx Priority Overnight shipping and delivery.

Overall, the Si 850 has a quality feel. Unlike some laptops that seem to be slapped together and thrown in a box, the Si 850 is solid and fully integrated. It comes with clear documentation that makes it suitable for neophytes. Its solid construction and its good performance make it suitable for everyone.

WinBook Si 850

PROS

- CD-RW drive
- Solid construction

CONS

- Tech support not 24/7
- Mediocre battery runtime

Company Profiles

Acentio, Inc.

Founded: 1995

Ownership: Privately held corporation

Annual Sales: \$10 million

Employees: 55

Products: Notebooks, custom NT and Linux servers, storage servers, Linux boxes, PC systems, workstations

Distribution: Direct

Major Customers: Government, schools, universities, small to medium-sized businesses

Executive Management: Frank Wu, CEO

Compaq Computer Corp.

Founded: 1982

Ownership: Publicly held corporation

Annual Sales: \$38.5 billion (1999)

Employees: 67,100 (worldwide)

Products: Desktops, laptops, professional workstations, network servers, mainframes, network peripherals, mass-storage devices;

handheld and palmtop PCs

Distribution: Direct, resellers, VARs, superstores, mass merchandisers, systems integrators, independent retailers

Major Customers: Fortune 1000 corporations, educational institutions, small to medium-sized businesses, government, individual consumers

Executive Management: Michael Capellas, Chair. & CEO

Dell

Founded: 1984

Ownership: Publicly held corporation

Annual Sales: \$30 billion

Employees: 39,000 (worldwide)

Products: Desktops, laptops, workstations, servers, storage

Distribution: Direct

Major Customers: Corporations, small businesses, government, educational institutions, individual consumers

Executive Management: Michael S. Dell, CEO; James T. Vanderslice, Vice Chair; Kevin B. Rallins, Vice Chair.

ePortables, Inc.

Founded: 1999

Ownership: Privately held corporation

Annual Sales: \$10 million

Employees: 8

Products: Notebooks

Distribution: Direct, resellers, VARs

Major Customers: Small to medium-sized businesses, corporations, small retailers, end-users

Executive Management: Tai Vuang, Sls. Mgr.

FOSA Computer, Inc.

Founded: 1991

Ownership: Privately held corporation

Annual Sales: \$16 million

Employees: 43

Products: Notebooks, mobile accessories

Company Profiles

Distribution: Direct, mail-order, Internet sales
Major Customers: Corporations, small to medium-sized businesses, end users
Executive Monogement: Frank Chen, Pres.; Simon Lo, VP

FutureTech Systems, Inc.

Founded: 1990
Ownership: Privately held corporation
Annual Sales: \$8.2 million (est.)
Employees: 15
Products: High-end laptops, overhead-projector-ready laptops and servers
Distribution: Mail-order, direct
Major Customers: Corporations, small businesses, government, educational institutions, individual consumers
Executive Monogement: Perikoruuppon Nogoppo, Pres.

IBM Corp.

Founded: 1911
Ownership: Publicly held corporation
Annual Sales: Approximately \$87.5 billion (1999)
Employees: 307,401 (1999)
Products: Business PCs, home/home-office computing, notebooks and PC companions, servers, thin clients, workstations, microelectronics, networking, ports and peripherals, printing systems, software, storage
Distribution: Dealers, direct, resellers
Major Customers: Large corporations, government, educational institutions, small businesses, individual consumers
Executive Monogement: Louis V. Gerstner Jr., Chair. & CEO

KDS Computers, Inc.

Founded: 1997
Ownership: Privately held corporation
Annual Sales: \$50 million
Employees: 30
Products: Laptops
Distribution: Resellers, retail, distribution channel
Major Customers: Fortune 500, government, education, retail
Executive Monogement: Soeed Shohbozi, CEO & Pres.; Del Lorsh, VP Sls.; Bob Iwosoki, VP Eng./Service; Boo Vu, VP Mfgng.

Mox Group Corp.

Founded: 1985
Ownership: N/A

Annual Sales: \$300 million
Employees: 280
Products: Desktops, laptops, servers
Distribution: N/A
Major Customers: Small to medium-sized businesses, corporations, government, education
Executive Monogement: Johnny Tsoi, Pres.

Micro Express

Founded: 1986
Ownership: Privately held corporation
Annual Sales: \$45 million (1999)
Employees: 74
Products: Desktops, notebooks, portable PCs, add-ons, peripherals
Distribution: Mail-order, direct
Major Customers: Small to large businesses
Executive Monogement: Art Afshor, Pres.

micronpc.com

Founded: 1995
Ownership: Publicly held corporation
Annual Sales: \$327.7 million (Fiscal 1999)
Employees: 3,200 (worldwide)
Products: Desktops, notebooks, servers
Distribution: Direct
Major Customers: Government, commercial, and small to medium-sized businesses
Executive Monogement: Joel Kocher, CEO & Pres.

NEC Computers Inc.

Founded: 2000
Ownership: Privately held corporation
Annual Sales: N/A
Employees: 400
Products: Desktops, notebooks, handheld PCs, servers
Distribution: VARs, resellers, direct, retail
Major Customers: Corporations, small to medium-sized businesses
Executive Monogement: Michel Fromont, CEO

PC Club

Founded: 1992
Ownership: Privately held corporation
Annual Sales: N/A
Employees: 250
Products: Desktops, notebooks, servers, and workstations, PC hardware components
Distribution: Resellers, direct and mail-order
Major Customers: End-users, small to medium-sized businesses
Executive Monogement: Jackson Lon, Pres.

ProStor Computer, Inc.

Founded: 1992
Ownership: Privately held corporation
Annual Sales: \$40 million
Employees: 40
Products: Notebooks
Distribution: Mail-order, VAR, direct
Major Customers: Resellers, direct
Executive Monogement: Teery Wong, Pres.

Sceptre Technologies

Founded: 1972
Ownership: Privately held corporation
Annual Sales: N/A
Employees: 100 (approx.)
Products: Notebooks, monitors, LCD panels
Distribution: Dealers, VARs
Major Customers: Corporations, businesses, government
Executive Monogement: Stephen Liu, CEO & Pres.

Toshiba America Information Systems, Inc.

(subsidiary of Toshiba Corp.)
Founded: 1989
Ownership: Privately held corporation
Annual Sales: N/A
Employees: N/A
Products: Laptops, desktops, servers, ultraportables, monitors, projectors, wireless products, and software solutions
Distribution: Resellers, distributors, select retail channels, mail-order, www.shoptoshiba.com
Major Customers: Corporations, government, educational institutions, small to medium-size businesses, small office/home office customers, individual consumers
Executive Monogement: Yoshihiro Moedo, Pres. & CEO

WinBook Corp.

Founded: 1993
Ownership: Wholly owned subsidiary of Micro Electronics
Annual Sales: \$1.3 billion (Micro Electronics, Inc.)
Employees: 2,500 (Micro Electronics, Inc.)
Products: Notebooks
Distribution: Micro Center retail stores, direct
Major Customers: Corporations, government, educational institutions, small to large businesses, consumers
Executive Monogement: Richard Mershod, Pres.

COMPARISON CHARTS

NOTEBOOKS UNDER \$2,000

MAKE/MODEL	PRICE	CPU & Memory			Drives			Video System				Audio System			
		PROCESSOR/ CLOCK SPEED (MHz)	L2 CACHE (K)	MEMORY Std.-Max./TYPE	HARD DRIVE (GB)	FLOPPY DRIVE	ROM DRIVE TYPE/SPEED (X)	DISPLAY (in.) /TYPE	RESOLUTION	VIDEO CONTROLLER/ VIDEO MEMORY (MB)	MPEG SUPPT.	AUDIO CHIPSET/ SYNTHESIS	INT. SPEAKER	INT. MIC	MODEM (Kbps)
Acentia/Admira N5i	\$1,999	PIII/800	256	128-256/SDR	20.0/M	I	D/8	14.1/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	56
Acentia/Linux 620	1,961	PIII/650	256	64-256/SDR	6.4/M	M	C/24	14.1/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	56
Acer/TravelMate 343TV	1,999	PIII/500	256	64-256/SDR	10.0/M	I	0/6	12.1/A	XGA	TR/2.5	SW	ESS/FM	Y/2	Y	56
Acer/TravelMate 521TE	1,599	PIII/600	256	64-512/SDR	6.0/M	I	C/24	13.3/A	SVGA	ATI/8	SW	ALI/WT	Y/2	Y	56
ARM/ARMNote 34052-14T	1,940	PIII/800	256	128-512/SDR	20.0/I	I	0/8	14.1/A	XGA	SiS/32	HW	SiS/WT	Y/2	Y	56
ARM/ARMNote N38N2-12T	1,540	CEL/700	128	64-512/SDR	10.0/I	I	C/24	12.1/A	SVGA	TR/8	HW	AOI/FM	Y/2	Y	56
ASUS/A1200-C700	1,399	CEL/700	128	64-320/SDR	5.0/I	I	C/24	12.0/A	SVGA	SiS/64	SW	AC/FM	Y/2	Y	56
ASUS/A1300-P700	1,699	PIII/700	256	64-320/SDR	5.0/I	I	C/24	13.0/A	XGA	SiS/64	SW	AC/FM	Y/2	Y	56
The Brick/NoteBrick ⁵	999	K6-2/400	128	32-256/SDR	4.0/I	I	C/24	12.1/H	SVGA	SMI/2	SW	ESS/WT	Y/2	Y	56
Casia/Cassapeia Fiva MPC-102	1,499	GX/233	16	64-96/SDR	6.0/I	M		6.7/A	SVGA	Cyrix/2.5	HW	SB-Camp./♦	Y	Y	56
CHEM USA/Chem8aak 7200E	1,799	PIII/650	256	64-192/SDR	6.0/I	I	C/24	13.3/A	XGA	SMI/4		AO/WT	Y/2	Y	56
Cmpaq/Armada E500	1,999	PIII/600	256	64-576/SDR	12.0/M	M	C/24	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2		
Cmpaq/Presaria 1200XL125	1,699	K6-2/533	128	64-192/SDR	6.0/I	I	C/24	13.3/A	SXGA	TR/4	SW	JBL/FM	Y/2	○	56
Cmpaq/Presaria 14XL244	1,499	CEL/566	128	64-320/SDR	6.0/I	I	C/24	13.0/H	XGA	TR/8	SW	JBL/FM	Y/2	○	56
Cmpaq/Presaria 17XL265	1,999	PIII/600	256	64-512/SDR	6.0/I	I	0/8	14.1/A	XGA	ATI/8	SW	JBL/WT	Y/2	Y	56
CVT/ViewPoint XLOP3-650MX	1,994	PIII/650	256	128-512/SDR	10.0/M	M	C/24	14.1/A	XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Dell/Inspiran 3800	1,199	CEL/600	128	64-512/SDR	5.0/I	M	C/24	12.1/A	SVGA	ATI/8	SW	ESS/WT	Y/2	○	56
Dell/Inspiran 4000	1,977	PIII/700	256	128-512/SDR	10.0/I	M	C/24	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
Dell/Latitude CPi 5600GT	1,749	CEL/600	128	64-512/SDR	6.0/I	I	C/24	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
Dell/Latitude CPi S600ST	1,499	PIII/600	256	64-512/SDR	6.0/I	M	C/24	12.1/A	SVGA	ATI/8	SW	ESS/WT	Y/2	Y	56
Euracom/3100-8	1,869	PIII/700	256	64-256/SDR	6.0/M	M	C/24	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
Euracom/3420-LX	1,599	CEL/500	128	64-512/SDR	6.0/M	M	C/24	13.3/A	XGA	ATI/8	SW	S8/WT	Y/2	Y	56
FOSA/34505-3	1,525	CEL/500	128	64-256/SDR	6.0/M	M	C/24	13.3/A	XGA	ATI/8	SW	Yamaha/WT	Y/2	Y	56
FOSA/34565-4	1,695	PIII/650	256	64-256/SDR	20.0/M	M	C/24	14.1/A	XGA	SiS/8	SW	SiS/WT	Y/2	Y	56
FOSA/34575-4	1,865	PIII/750	256	64-256/SDR	20.0/M	M	0/8	14.1/A	XGA	SiS/8	SW	SiS/WT	Y/2	Y	56
Fujitsu/B-2175	1,999	CEL/500	128	128-1,256/SDR	10.0/I	M	C/24	10.4/A	SVGA	ATI/4	○	Intel/WT	Y	Y	56
Fujitsu/E-6541	1,999	PIII/600	256	64-2,512/SDR	12.0/M	M	0/8	14.1/A	XGA	ATI/8	SW	ESS/WT	Y	Y	56
Fujitsu/i-4190	1,599	CEL/600	128	64-1,192/SDR	10.0/I	M	C/20	12.1/A	SVGA	ATI/4	SW	Intel/WT	Y	Y	56
FutureTech/FM 34xF3	1,899	PIII/800	256	128-512/SDR	10.0/M	I	0/8	14.1/A	XGA	SiS/8	SW	SiS/WT	Y/2	Y	56
FutureTech/FM34XF3-13	1,449	CEL/500	128	64-512/SDR	10.0/M	I	C/24	13.3/A	XGA	SiS/10	SW	SiS/WT	Y/2	Y	56
Gateway/Sala 5300 LS	1,798	CEL/600	128	32-512/SDR	6.0/I	M	C/24	14.1/A	XGA	S3/8	♦	ESS/WT	Y/2	Y	56
IBM/ThinkPad i Series 1200 11U	1,049	CEL/550	128	32-160/SDR	5.0/I	I	C/24	12.1/H	SVGA	SMI/2	SW	S8-Camp./♦	Y	Y	56
IBM/ThinkPad i Series 1300 61U	1,449	CEL/600	128	64-192/SDR	10.0/I	I	C/24	12.1/H	SVGA	SMI/4	SW	S8-Camp./♦	Y	Y	56

(*) included; () not included; (2) two included; (3) three included; (4) four included; (♦) information not available at press time. Please refer to the key on page 180 for an explanation of abbreviations used above.

Input/Output Interfaces													PC Cards		Input	Additional Features					Warranty
SERIAL	PARALLEL	EXTERNAL FDD	EXT. MONITOR	AUDIO LINE (In/Out)		S-VIDEO (In/Out)	COMPOSITE VIDEO (In/Out)	EXT. MICROPHONE	HEADPHONE/SPEAKER	MIDI/GAME	DOCKING STA./PORT REP.	INFRARED	USB	TYPE II/TYPE III SLOTS	ZOOMED VIDEO/CARDBUS	KEYBOARD/POINTING DEVICE	BATTERY: TYPE/LIFE (hrs.)	DIMENSIONS (WxDxH in.)	WEIGHT (lbs. w/ batt. incl.)	ADDITIONAL SYSTEM INFO & ACCESSORIES	
•	•	•	•	I/O	I/O	0	•	•	•	•	•	•	•	2/1	Z/C	101-key/TP	Li-Ion/2	12.7 x 10.5 x 1.6	7.5	Win98	1-yr.
•	•	•	•	I/O	I/O	0	•	•	•	•	•	•	•	2/1	Z/C	101-key/TP	Li-Ion/2	12.7 x 10.5 x 1.6	7.5	Red Hot Linux 7	1-yr.
•	•	•	•	I/O	I/O		•	•	•	•	•	•	•	1/0	Z/C	84-key/TP	Li-Ian/2.5	11.4 x 8.6 x .9	4.0	Win98, MS Works 2000, USB camero	1-yr.
•	•	•	•	I/O	I/O		•	•	•	•	•	•	•	2/1	Z/C	84-key/TP	Li-Ion/4	12 x 10 x 1.4	6.6	Win98, MS Works 2000, Puma IntelliSync	1-yr.
•	•	•	•				•	•	•	•	•	•	•	1/1	Z/C	87-key/TP	Li-Ian/2	12.4 x 10.1 x 1.6	6.5	Win98, Star Office Suite	1-yr.
•	•	•	•				•	•	•	•	•	•	•	2/1	Z/C	87-key/TP	NiMH/2.5	12.1 x 10.5 x 1.5	7.4	Win98, Stor Office Suite	1-yr.
•	•	•	•	I/O	0		•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ion/2.5	12.1 x 9.8 x 1.6	6.3	Win98, carrying cose	1-yr.
•	•	•	•	I/O	0		•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ian/3.5	12.1 x 9.8 x 1.6	6.6	Win98, carrying case	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	0/1	Z/C	87-key/TP	NiMH/2.5-3	12.1 x 10 x 1.5	6.3	Win98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/0	•/C	96-key/TP	Li-Ion/3	8.3 x 5.2 x 1	1.8	Win98	1-yr.
•	•	•	•	I	•	•	•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ian/3	11.6 x 9.1 x 1.5	6.0	Win98, carrying case	1-yr.
•	•	•	•	0		0	•	•	•	•	•	•	•	2/1	Z/C	83-key/PS/TP	Li-Ian/3.5	12.4 x 10 x 1.6	5.5	Win95/98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ian/3.5	12.2 x 10.1 x 1.9	7.3	WinMe, MS Money/Ward, McAfee VirusScon	1-yr.
•	•	•	•	I/O	0		•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	NiMH/2	13.1 x 11 x 1.8	6.5	WinMe, MS Money/Word, McAfee VirusScon	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	•	1/1	Z/C	88-key/TP	Li-Ion/3	12.1 x 10.4 x 1.3	5.6	WinMe	1-yr.
•	•	•	•	I/O	I		•	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/2	12.7 x 10.2 x 1.5	7.2	Win98, carrying case	1-yr.
•	•	•	•	0	0	0	•	•	•	•	•	•	•	2/1	Z/C	87-key/PS/TP	Li-Ian/2	12.6 x 9.9 x 1.8	6.4	WinMe, MS Works Suite 2001, Money 2001	1-yr.
•	•	•	•	0	0	0	•	•	•	•	•	•	•	2/1	Z/C	87-key/PS/TP	Li-Ion/2	12.5 x 10 x 1.5	5.6	WinMe, MS Office 2000 SB	1-yr.
•	•	•	•	I/O	I/O		•	•	•	•	•	•	•	2/1	Z/C	87-key/PS/TP	NiMH/4	12.5 x 9.9 x 1.7	7.3	Win98	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	•	2/1	Z/C	87-key/PS/TP	Li-Ian/4	12.6 x 9.9 x 1.7	6.5	Win98	1-yr.
•	•	•	•	I/O	0	I/O	•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ion/2	12.4 x 10.1 x 1.5	7.7	Win98/2000/NT, carrying case, FireWire port	1-yr.
•	•	•	•	I/O	0		•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/3	12.2 x 9.2 x 1.3	5.0	Win98/2000/Me/NT, carrying cose	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ian/3.5	12 x 9.1 x 1.3	5.7	Win98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/2.5	12.4 x 10 x 1.5	6.5	Win98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/2.5	12.4 x 10 x 1.5	6.5	Win98	1-yr.
•	•	•	•				•	•	•	•	•	•	•	2/1	•/C	85-key/TP	Li-Ion/2.5	9.8 x 8.5 x 1.3	3.4	Win98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ian/4	12.1 x 10.3 x 1.4	6.5	Win98	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	•	2/1	•/C	87-key/TP	Li-Ion/3	12.1 x 10.9 x 1.8	6.6	Win98/Me, CD-RW	1-yr.
•	•	•	•	I/O		•	•	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/3	12.4 x 10.1 x 1.5	6.5	Win98/Me, Caryl WP Office 2000	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/0	Z/C	87-key/TP	Li-Ion/3	12.4 x 10.1 x 1.5	6.5	Win98/Me, CD-RW	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ion/3	12.2 x 9.9 x 1.4	4.9	Win98, carrying cose	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/1	Z/C	85-key/PS	NiMH/2.5	12.3 x 9.9 x 1.4	5.9	Win98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	•	1/1	Z/C	85-key/PS	NiMH/2.5	12.3 x 9.9 x 1.4	6.0	Win98	1-yr.

(•) included; () not included; (2) two included; (3) three included; (4) four included; (♦) information not available at press time. Please refer to the key on page 180 for an explanation of abbreviations used above.

COMPARISON CHARTS

NOTEBOOKS UNDER \$2,000

MAKE/MODEL	PRICE	CPU & Memory			Drives			Video System				Audio System			
		PROCESSOR/ CLOCK SPEED (MHz)	L2 CACHE (K)	MEMORY Std.-Max./TYPE	HARD DRIVE (GB)	FLOPPY DRIVE	ROM DRIVE TYPE/SPEED (X)	DISPLAY (in.)/TYPE	RESOLUTION	VIDEO CONTROLLER/ VIDEO MEMORY (MB)	MPEG SUPPT.	AUDIO CHIPSET/ SYNTHESIS	INT. SPEAKER	INT. MIC	MODEM (Kbps)
IBM/ThinkPad i Series 1300 91U	\$1,799	PIII/650	256	64-192/SDR	20.0/I	I	C/24	13.3/H	XGA	SMI/4	SW	S8-Comp./♦	Y	Y	S6
IBM/ThinkPad X20 11U	1,899	CEL/500	128	64-320/SDR	10.0/I	I		12.1/A	SVGA	ATI/4	SW	S8-Comp./♦	Y	Y	S6
KDS/ThinNote 2360iCT	1,699	CEL/600	128	64-192/SDR	6.0/I	M	C/24	13.3/A	XGA	ATI/8	SW	Crystal/FM	Y/2		S6
KDS/Voliant 6380iPTD	1,599	PIII/800	256	64-512/SDR	10.0/I	I	D/8	13.3/A	XGA	TR/8	SW	Crystal/FM	Y/2	Y	S6
Keydata/KeyNote 6600 A	1,595	PIII/750	256	64-512/SDR	6.0/I	I	C/24	13.3/A	XGA	SiS/8	SW	SiS/WT	Y/2	Y	S6
LEK/Mini IdeoBook	1,195	MMX/266	256	32-160/SDR	4.3/M	M	C/24	8.4/A	SVGA	NM/1.2	SW	Yamaha/WT	Y	Y	S6
M-Tech/3153	1,800	PIII/800	256	128-256/SDR	20.0/M	M	D/8	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	S6
M-Tech/3593	1,855	PIII/700	256	128-256/SDR	10.0/M	M	D/8	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	S6
MA Labs/DecisionMaker 1001	850	MMX/233	512	32-128/SDR	2.0/M	M	C/24	8.0/A	SVGA	NM/2	SW	S8-Comp./WT	Y/2	Y	S6
MA Labs/DecisionMaker 1003	1,450	CEL/466	128	64-256/SDR	6.0/I	M	C/24	14.1/A	XGA	SMI/4	SW	Rockwell/WT	Y/2	Y	S6
MA Labs/DecisionMaker 1007	1,710	PIII/600	256	64-256/SDR	6.4/I	M	C/24	14.1/A	XGA	ATI/8	SW	Rockwell/WT	Y/2	Y	S6
Mars/MorsPol A2000S	1,189	MMX/266	512	32-288/SDR	6.0/I	M	C/24	8.2/H	VGA	NM/1.2	SW	Yamaha/FM	Y/2	Y	S6
Max/MAX8DDK-340-360F3	1,349	PIII/600	256	64-512/SDR	6.0/M	I	C/24	13.1/A	XGA	SiS/8	HW	SiS/WT	Y/2		S6
Mox/MAX8DDK-N38-470M3	1,699	PIII/700	256	64-512/SDR	6.0/M	M	C/24	14.1/A	XGA	TR/8	SW	VIA/WT	Y/2	Y	S6
Mox Group/MoxNate S033+	1,399	CEL/600	128	32-160/SDR	6.0/I	I	C/24	12.1/A	SVGA	ATI/4	SW	Crystal/WT	Y	Y	S6
Mox Group/MoxNote 6120	1,699	CEL/600	128	64-256/SDR	10.0/I	I	C/24	14.1/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	S6
MedioBook/330i	1,925	PIII/600	256	64-320/SDR	6.4/M	M	C/24	13.1/A	XGA	ATI/8	HW	Crystal/WT	Y/2	Y	S6
Micro Express/N84800	1,899	PIII/800	256	128-256/SDR	10.0/I	I	D/6	14.1/A	XGA	ATI/8	HW	ESS/WT	Y/2	Y	S6
Micro Express/N88700	1,999	PIII/650	256	128-256/SDR	10.0/I	I	D/6	15.0/A	XGA	ATI/8	HW	ESS/WT	Y/2	Y	S6
PC Notebook/Jaguar 3 Pro	1,699	CEL/600	128	64-256/SDR	6.0/M	M	C/24	13.3/A	XGA	SiS/32	HW	SiS/WT	Y/2		S6
PC Notebook/Trovelcat Exec	1,999	PIII/650	256	128-256/SDR	12.0/M	M	C/24	12.1/A	SVGA	ATI/8	HW	ESS/WT	Y/2	Y	S6
Polywell/PolyNate 8400/650	1,999	PIII/650	256	128-256/SDR	10.0/I	I	C/24	14.0/A	SXGA	S3/8	HW	AD/FM	Y/2	Y	S6
Polywell/PolyNote K6-500	999	K6-2+/500	128	32-160/SDR	6.4/I	I	C/24	12.0/H	XGA	S3/4	SW	AD/FM	Y/2	Y	S6
Sony/VAIO PCG-FS20	1,799	PIII/500	256	64-256/SDR	6.0/I	M	C/24	13.0/H	SVGA	NM/2.5	SW	S8-Comp./♦	Y	Y	S6
Toshiba/Satellite 171S XCDS	1,099	CEL/600	128	64-192/SDR	6.0/I	I	C/24	13.0/P	SVGA	ATI/4	SW	Crystal/FM	Y/2		S6
Toshiba/Satellite 1750	1,499	CEL/700	128	64-192/SDR	10.0/I	I	D/8	13.3/A	XGA	ATI/4	SW	Crystal/FM	Y/2		S6
Toshiba/Satellite 175S	1,499	CEL/700	128	64-192/SDR	10.0/I	I	D/8	13.3/A	XGA	ATI/4	SW	Crystal/FM	Y/2		S6
Toshiba/Satellite 280S-S201	1,599	CEL/650	128	64-320/SDR	6.0/I	I	D/8	13.3/A	XGA	S3/8	SW	Yamaha/FM	Y/2		S6
Toshiba/Satellite Pro 4300	1,799	PIII/600	256	64-320/SDR	6.0/I	I	D/8	12.1/A	SVGA	S3/8	SW	Yamaha/FM	Y/2		S6
Twinhead/A3000	1,420	PIII/750	256	128-256/SDR	10.0/I	I	C/24	13.3/H	XGA	SiS/8	HW	SiS/WT	Y/2	Y	S6
Twinhead/AS010	1,690	PIII/750	256	128-512/SDR	10.0/I	I	C/24	13.3/A	XGA	SiS/8	HW	SiS/WT	Y/2	Y	S6
WinBook/Si 700	999	CEL/700	128	64-512/SDR	6.0/I	I	C/24	12.1/H	SVGA	ATI/4	HW	ESS/WT	Y/2	Y	S6
WinBook/Si 800 DVD	1,699	PIII/800	256	64-512/SDR	6.0/I	I	D/8	14.1/A	XGA	ATI/4	HW	ESS/WT	Y/2	Y	S6

(*) included; () not included; (2) two included; (3) three included; (4) four included; (♦) information not available at press time. Please refer to the key on page 180 for an explanation of abbreviations used above.

Input/Output Interfaces													PC Cards	Input	Additional Features				WARRANTY
SERIAL	PARALLEL	EXTERNAL FDD	EXT. MONITOR	AUDIO LINE (In/Out)	S-VIDEO (In/Out)	COMPOSITE VIDEO (In/Out)	EXT. MICROPHONE	HEADPHONE/SPEAKER	MIDI/GAME	DOCKING STA./PORT REP.	INFRARED	USB	TYPE II/TYPE III SLOTS	ZOOMED VIDEO/CARDBUS	KEYBOARD/POINTING DEVICE	BATTERY: TYPE/LIFE (hrs.)	DIMENSIONS (WxDxH in.)	WEIGHT (lbs. w/ batt. incl.)	ADDITIONAL SYSTEM INFO & ACCESSORIES
•	•	•	•	I/O		•	•	•	•	•	•	•	1/1 Z/C	85-key/PS	NiMH/2.9	12.3 x 9.9 x 1.4	6.0	Win98	1-yr.
•	•	•	•	I/O		•	•	•	•	•	•	•	1/0	85-key/PS	Li-Ion/2	11 x 8.9 x 1.1	3.1	Win98	3-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	1/0 Z/C	85-key/TP	Li-Ion/2	11.7 x 9.5 x 1	4.3	WinMe	1-yr.
•	•	•	•	•	•	•	•	•	•	•	•	•	2/0 Z/C	87-key/TP	Li-Ion/2.5	12.2 x 10 x 1.5	6.8	WinMe, FireWire port	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	2/1 Z/C	87-key/TP	Li-Ion/2.5	12.4 x 10 x 1.5	6.5	Win98	1-yr.
•	•	•	•	•	•	•	•	•	•	•	•	•	1/0 Z/C	84-key/PS	Li-Ion/2	10.2 x 6.7 x 1.2	2.7	Win98, Corel WP Office 2000	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/0 Z/C	88-key/TP	Li-Ion/3	12.5 x 10.2 x 1.4	7.2	Win98, Star Office Suite 5.2, carrying case	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/0 Z/C	88-key/TP	Li-Ion/3	12.5 x 10.2 x 1.4	7.2	Win98, Star Office Suite 5.2, carrying case	1-yr.
•	•	•	•	0		•	•	•	•	•	•	•	1/0 Z/C	85-key/PS/TP	NiMH/1.5	10.9 x 7 x 1.4	3.7	auto adapter, carrying case	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	1/0 Z/C	87-key/TP	Li-Ion/2.5	12.4 x 10 x 1.2	5.7	carrying case	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	1/0 Z/C	84-key/TP	Li-Ion/2.5	12.8 x 10.5 x 1.5	7.2	carrying case, FireWire port	1-yr.
•	•	•	•	•	•	•	•	•	•	•	•	•	1/0 Z/C	85-key/PS/TS	Li-Ion/1.2	10.2 x 6.7 x 1.2	2.9	Win98, carrying case	1-yr.
•	•	•	•	•	•	•	•	•	•	•	•	•	1/1 Z/C	86-key/TP	Li-Ion/2	12.4 x 10 x 1.5	6.5	Win98, carrying case	1-yr.
•	•	•	•	•	•	•	•	•	•	•	•	•	2/1 Z/C	87-key/TP	NiMH/2	10.5 x 12.1 x 1.6	7.4	Win98, carrying case	1-yr.
•	•	•	•	•	•	•	•	•	•	•	•	•	1/1 Z/C	86-key/TP	NiMH/2.5	11.7 x 9.5 x 1.6	6.0	Win98, carrying case	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/0 Z/C	86-key/TP	Li-Ion/3.5	12.6 x 10.1 x 1.5	6.9	Win98, carrying case	1-yr.
•	•	•	•	I	0	I/O	•	•	•	•	•	•	1/0 Z/C	84-key/TP	Li-Ion/3	12.1 x 9.5 x 1	4.0	Win98, carrying case	4-yr.
•	•	•	•	I/O	0	I/O	•	•	•	•	•	•	2/1 Z/C	86-key/TP	Li-Ion/3.3	12.2 x 9.5 x 1.8	7.3	Win98, carrying case	2-yr.
•	•	•	•	I/O	0	I/O	•	•	•	•	•	•	2/1 Z/C	86-key/TP	Li-Ion/3	12.8 x 10.5 x 1.5	7.2	Win98, carrying case	2-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	1/1 Z/C	87-key/TP	Li-Ion/2.3	12.4 x 10 x 1.5	6.5	Win98	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	1/1 Z/C	86-key/TP	Li-Ion/2.5-3	13.1 x 12.9 x 1.2	4.9	Win98	1-yr.
•	•	•	•	I/O	I/O	0	•	•	•	•	•	•	2/1	88-key/TP	Li-Ion/3	12.2 x 10 x 1.4	6.4	Win98/Me, Norton AntiVirus, Lotus SmartSuite	1-yr.
•	•	•	•	I/O	•	0	•	•	•	•	•	•	2/1	88-key/TP	NiMH/2	12.2 x 10 x 1.4	6.8	Win98/Me, Norton AntiVirus, Lotus SmartSuite	1-yr.
•	•	•	•	I/O	I/O	0	•	•	•	•	•	•	2/1 Z/C	88-key/TP	Li-Ion/2.3	12.8 x 10.5 x 1.9	7.4	Win98, MS Word 2000	1-yr.
•	•	•	•	0	I	•	•	•	•	•	•	•	2/1 Z/C	86-key/PS	NiMH/2	12.6 x 10.9 x 1.5	6.9	WinMe	1-yr.
•	•	•	•	•	•	I/O	•	•	•	•	•	•	2/1 Z/C	85-key/PS	NiMH/2	12.6 x 10.9 x 1.5	6.9	WinMe, McAfee ActiveShield	1-yr.
•	•	•	•	•	•	I/O	•	•	•	•	•	•	2/1 Z/C	85-key/PS	NiMH/2	12.6 x 10.9 x 1.5	6.9	WinMe, Lotus SmartSuite Millennium	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/1 Z/C	85-key/PS	Li-Ion/2	12.9 x 10.7 x 1.5	7.3	WinMe	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/1 Z/C	85-key/PS	Li-Ion/2.5	12.2 x 10.2 x 1.7	7.0	Win98, Norton AntiVirus	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	2/1 Z/C	85-key/TP	Li-Ion/2.5	12.5 x 10.3 x 1.6	6.4	Win98, carrying case	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	2/1 Z/C	85-key/TP	Li-Ion/3	12.5 x 10.3 x 1.4	6.4	Win98, carrying case	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/1 Z/C	87-key/TP	NiMH/2.3	12.2 x 9.6 x 1.5	6.9	WinMe	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/1 Z/C	87-key/TP	Li-Ion/2.3	12.2 x 9.6 x 1.5	7.1	WinMe	1-yr.

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COMPARISON CHARTS

NOTEBOOKS OVER \$2,000

MAKE/MODEL	PRICE	CPU & Memory			Drives			Video System				Audio System			
		PROCESSOR/ CLOCK SPEED (MHz)	L2 CACHE (K)	MEMORY Std.-Max./TYPE	HARD DRIVE (GB)	FLOPPY DRIVE	ROM DRIVE TYPE/SPEED (X)	DISPLAY (in.)/TYPE	RESOLUTION	VIDEO CONTROLLER/ VIDEO MEMORY (MB)	MPEG SUPPT.	AUDIO CHIPSET/ SYNTHESIS	INT. SPEAKER	INT. MIC	MODEM (Kbps)
Acentia/Linux 630	\$3,349	PIII/800	256	256-512/SDR	20.0/M	M	0/8	14.1/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	56
Acer/TravelMate 525TXV	2,399	PIII/700	256	128-512/SDR	10.0/M	I	0/8	14.1/A	XGA	ATI/8	SW	ALI/FM	Y/2	Y	56
Acer/TravelMate 602TER	2,299	PIII/650	256	128-384/SDR	12.0/I	M	C/20	13.3/A	XGA	ATI/8	HW	ESS/WT	Y/2	Y	56
Acer/TravelMate 737TLV	2,764	PIII/700	256	128-512/SDR	18.0/M	I	D/6	15.0/A	XGA	ATI/8	HW	ESS/WT	Y	Y	56
AMREL/Rackly II+ PIII 500	5,745	PIII/500	256	64-256/SDR	6.0/M	M	C/24	12.1/A	XGA	NM/2.5	SW	NM/FM	Y/2		
ARM/ARMNate 895-14T	2,049	PIII/800	256	128-512/SDR	20.0/I	I	0/8	14.1/A	XGA	TR/8	SW	SB-Camp./FM	Y/2	Y	56
ARM/ARMNate N20U-L	2,268	PIII/650	256	64-512/SDR	10.0/M	M	0/8	13.3/A	XGA	ATI/8	HW	Crystal/WT	Y/2	Y	56
ARM/ARMNate N38W2-5P	3,325	PIII/850	256	128-512/SDR	30.0/M	I	C/20	15.1/A	SXGA	ATI/16	SW	ESS/FM	Y/2	Y	56
ASUS/L8400C-800C	2,399	PIII/800	256	128-256/SDR	20.0/I	I	C/24	14.1/A	XGA	S3/8	SW	AD/FM	Y/2	Y	56
ASUS/L8400C-800D	2,499	PIII/800	256	128-192/SDR	20.0/I	I	0/6	14.1/A	XGA	S3/8	SW	A0/FM	Y/2	Y	56
ASUS/58200-8000	2,199	PIII/800	256	64-192/SDR	20.0/I	M	0/8	12.0/A	SVGA	SMI/8	SW	ESS/FM	Y/2	Y	56
The Brick/Elite 2	2,395	PIII/650	256	64-256/SDR	6.0/I	I	D/4	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
The Brick/MicraLite	2,495	PIII/750	256	64-320/SDR	12.0/I	M	C/24	13.3/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	56
The Brick/Speed Brick	2,795	PIII/650	256	64-512/SDR	20.0/I	I	D/8	15.0/A	XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Casia/Cassiopeia Fiva MPC-S01	2,199	GX/200	16	32-96/SDR	6.0/I	M		6.7/A	SVGA	Cyrix/◆		SB-Camp./◆	Y	Y	56
CHEM USA/Chem8aak 2020	2,149	PIII/750	256	128-256/SDR	10.0/I	M	C/24	13.3/A	XGA	ATI/8		Crystal/WT	Y/2	Y	56
CHEM USA/Chem8aak 8400C	2,059	PIII/700	256	128-320/SDR	6.0/I	I	C/24	14.1/A	XGA	S3/8		ESS/WT	Y/2	Y	56
Cmpaq/Armada E500	3,699	PIII/850	256	128-576/SDR	20.0/M	M	0/8	15.1/A	XGA	ATI/8	SW	ESS/WT	Y/2		56
Cmpaq/Armada M300	2,699	PIII/600	256	64-320/SDR	12.0/M	M	0/8	12.1/A	XGA	ATI/8	SW	Cmpaq/WT	Y		56
Cmpaq/Presaria 1800XL190	2,999	PIII/700	256	128-320/SDR	6.0/I	I	0/6	15.0/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
Cmpaq/Presaria 1800XL280	2,499	PIII/650	256	64-320/SDR	6.0/I	I	0/8	15.0/A	XGA	ATI/8	SW	J8L/WT	Y/2	Y	56
CVT/ViewPoint XLDP3-750MXL	2,395	PIII/750	256	128-512/SDR	20.0/M	M	0/8	15.1/A	XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Dell/Inspiran 8000	3,006	PIII/850	256	128-512/SDR	10.0/I	M	0/8	15.0/A	SXGA	ATI/32	SW	ESS/WT	Y/2	Y	56
Dell/Latitude C600	2,448	PIII/750	256	128-512/SDR	10.0/I	M	C/24	14.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
Dell/Latitude C800	2,799	PIII/850	256	64-512/SDR	10.0/I	I	C/24	15.1/A	SXGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Dell/Latitude L5 H500ST	2,099	PIII/500	256	64-256/SDR	6.0/I	M	C/24	12.1/A	SVGA	NM/2.5	SW	NM/FM	Y	Y	56
Euracam/8500-SE	2,280	PIII/650	256	64-512/SDR	6.0/M	M	C/24	15.1/A	XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Euracam/8500-V	2,669	PIII/800	256	64-512/SDR	6.0/M	M	C/24	15.1/A	XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
FOSA/2865T3	2,120	PIII/650	256	64-128/SDR	10.0/M	M	D/8	15.1/A	XGA	ATI/8	SW	Yamaha/WT	Y/2	Y	56
FOSA/2875T3	2,395	PIII/750	256	64-128/SDR	20.0/M	M	0/8	15.1/A	XGA	ATI/8	SW	Yamaha/WT	Y/2	Y	56
FOSA/3475S-3	2,160	PIII/750	256	64-256/SDR	20.0/M	M	0/8	13.3/A	XGA	ATI/8	SW	Yamaha/WT	Y/2	Y	56
Fujitsu/8-2175	2,399	CEL/500	128	128-1,256/SDR	15.0/I	M	C/24	10.4/A	SVGA	ATI/4		Intel/WT	Y	Y	56
Fujitsu/E-6557	2,199	PIII/650	256	64-2,512/SDR	15.0/M	M	D/8	14.1/A	XGA	ATI/8	SW	ESS/WT	Y	Y	56

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Input/Output Interfaces													PC Cards	Input	Additional Features					Warranty
SERIAL	PARALLEL	EXTERNAL FDD	EXT. MONITOR	AUDIO LINE (In/Out)	S-VIDEO (In/Out)	COMPOSITE VIDEO (In/Out)	EXT. MICROPHONE	HEADPHONE/SPEAKER	MIDI/GAME	DOCKING STA./PORT REP.	INFRARED	USB	TYPE II/TYPE III SLOTS	ZOOMED VIDEO/CARDBUS	KEYBOARD/POINTING DEVICE	BATTERY: TYPE/LIFE (hrs.)	DIMENSIONS (WxDxH in.)	WEIGHT (lbs. w/ batt. incl.)	ADDITIONAL SYSTEM INFO & ACCESSORIES	
•	•	•	•	I/O	I/O	0	•	•	•	•	•	•	2/1	Z/C	101-key/TP	Li-Ion/3	12.7 x 10.5 x 1.6	7.5	Red Hat Linux 7, FireWire port	1-yr.
•	•	•	•	I/O			•	•	•	•	•	②	2/1	Z/C	84-key/TP	Li-Ion/4	12.1 x 10.1 x 1.8	6.8	Win98, Pumo IntelliSync, PC Doctor	1-yr.
•	•	•	•	I/O		•	•	•	•	•	•	②	1/0	Z/C	84-key/TP	Li-Ion/2.5	11.7 x 9.3 x 1.3	5.4	Win98/2000, Works 2000, PC Doctor, CO-RW	1-yr.
•	•	•	•	I/O	0		•	•	•	•	•	•	2/1	Z/C	84-key/TP	Li-Ion/2	12.8 x 10.7 x 1.4	8.0	Win98, MS Works 2000, PC Doctor, FireWire port	1-yr.
•	•	•	•	0			•	•	•	•	•	•	2/1	Z/C	89-key/TP	Li-Ion/2.5	12.3 x 9.7 x 2.5	9.5	Win98, ruggedized system	1-yr.
•	•	•	•				•	•	•	•	•	•	1/1	Z/C	87-key/TP	Li-Ion/2	12.2 x 10 x 1.5	6.5	Win98, Stor Office Suite	1-yr.
•	•	•	•		•	•	•	•	•	•	•	•	1/0	Z/C	85-key/TP	Li-Ion/3.5	12.1 x 9.5 x 1	4.1	Win98, Stor Office Suite, FireWire port	1-yr.
•	•	•	•	I	0		•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/3.5	12.7 x 10.2 x 1.6	7.8	Win98, Stor Office Suite, CD-RW, FireWire port	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ion/3	14.1 x 10 x 1.3	6.4	Win98, carrying case	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/1	Z/C	86-key/TP	Li-Ion/3	14.1 x 10 x 1.3	6.4	Win98, carrying case	1-yr.
•	•	•	•				•	•	•	•	•	•	2/1	Z/C	85-key/TP	Li-Ion/2.5	11.9 x 9.4 x 1.2	3.9	WinMe, carrying case	1-yr.
•	•	•	•	I/O		0	•	•	•	•	•	②	2/1	Z/C	88-key/TP	Li-Ion/3	12.6 x 10 x 1.6	7.2	Win98, carbon fiber/magnesium-alloy shell	4-yr.
•	•	•	•	I/O		•	•	•	•	•	•	•	1/0	Z/C	86-key/TP	Li-Ion/3	12 x 9.2 x 1.1	4.4	Win98, magnesium-alloy shell, McAfee VirusScan	4-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	87-key/TP	Li-Ion/3	12.8 x 10.2 x 1.7	7.8	Win98, carrying case, McAfee VirusScan	4-yr.
•	•	•	•	I/O		•	•	•	•	•	•	•	2/0	•/C	◆/TP	Li-Ion/3	8.3 x 5.2 x 1.1	1.8	Win98	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	1/0	Z/C	85-key/TP	Li-Ion/2.5	12.2 x 9.9 x 1.8	6.5	Win98, Ultra80se, carrying case	1-yr.
•	•	•	•	I	0	•	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/2	12.2 x 10 x 1.3	6.4	Win98, carrying case	1-yr.
•	•	•	•	0		0	•	•	•	•	•	•	2/1	Z/C	83-key/PS/TP	Li-Ion/3.5	12.4 x 10 x 1.6	5.5	Win95/98	1-yr.
•	•	•	•	0		•	•	•	•	•	•	•	1/0	Z/C	83-key/TP	Li-Ion/2	10.4 x 9 x .9	3.2	Win2000/NT	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	1/1	Z/C	88-key/TP	Li-Ion/3	12.9 x 11 x 1.7	7.9	WinMe	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/3	12.9 x 11 x 1.7	7.9	WinMe, MS Money/Word, McAfee VirusScan	1-yr.
•	•	•	•	I/O	I/O		•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/2	12.7 x 10.2 x 1.5	7.2	Win98, carrying case	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/1	Z/C	87-key/PS/TP	Li-Ion/2-3	13 x 10.8 x 1.8	7.9	WinMe, MS Office 2000 S8E, FireWire port	3-yr.
•	•	•	•	0	0	0	•	•	•	•	•	•	2/1	Z/C	87-key/PS/TP	Li-Ion/4	12.5 x 9.9 x 1.4	6.0	Win2000, wireless networking antenno	3-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	②	2/1	Z/C	87-key/PS/TP	Li-Ion/2-3	13 x 10.9 x 1.8	7.7	Win2000, wireless networking antenno	3-yr.
•	•	•	•	I/O		•	•	•	•	•	•	•	1/0	Z/C	84-key/TP	Li-Ion/2.5	10.7 x 8.7 x 1	3.5	Win2000	3-yr.
•	•	•	•	I/O	0	I/O	•	•	•	•	•	•	2/1	Z/C	102-key/TP	Li-Ion/3	14 x 10.8 x 2.1	9.5	Win98, carrying case, FireWire port	1-yr.
•	•	•	•	I/O	0	I/O	•	•	•	•	•	•	2/1	Z/C	102-key/TP	Li-Ion/3	14 x 10.8 x 2.1	9.5	Win98, carrying case, FireWire port	1-yr.
•	•	•	•	I/O		•	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/2.5	12.3 x 10.3 x 1.6	7.5	Win98, 10/100 NIC	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/2.5	12.3 x 10.3 x 1.6	7.5	Win98, 10/100 NIC	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	1/0	Z/C	88-key/TP	Li-Ion/3.5	12 x 9.1 x 1.3	5.7	Win98	1-yr.
•	•	•	•	•	•		•	•	•	•	•	•	2/1	•/C	85-key/TP	Li-Ion/2.5	9.8 x 8.5 x 1.3	3.4	Win2000	1-yr.
•	•	•	•	I/O			•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/4	12.1 x 10.3 x 1.4	6.5	Win2000	1-yr.

(•) included; () not included; (②) two included; (③) three included; (④) four included; (◆) information not available at press time. Please refer to the key on page 180 for an explanation of abbreviations used above.

COMPARISON CHARTS

NOTEBOOKS OVER \$2,000

MAKE/MODEL	PRICE	CPU & Memory			Drives			Video System				Audio System			
		PROCESSOR/ CLOCK SPEED (MHz)	L2 CACHE (K)	MEMORY Std.-Max./TYPE	HARD DRIVE (GB)	FLOPPY DRIVE	ROM DRIVE TYPE/SPEED (X)	DISPLAY (in.)/TYPE	RESOLUTION	VIDEO CONTROLLER/ VIDEO MEMORY (MB)	MPEG SUPPL.	AUDIO CHIPSET/ SYNTHESIS	INT. SPEAKER	INT. MIC	MODEM (Kbps)
Fujitsu/S-4S46	\$2,699	PIII/600	256	128-1,256/SDR	10.0/I	M	0/8	12.1/A	XGA	ATI/4	SW	Yamaha/WT	Y	Y	56
Fujitsu/S-4S46	3,399	PIII/600	256	256-1,256/50R	20.0/I	M	C/24	12.1/A	XGA	ATI/4	SW	Yamaha/WT	Y	Y	56
FutureTech/FM 8500V	2,399	PIII/933	256	128-384/50R	10.0/M	M	C/24	15.1/A	SXGA	515/16	SW	515/WT	Y/2	Y	56
FutureTech/FM 91XF3-15	2,699	PIII/850	256	128-512/SDR	10.0/M	M	C/24	15.1/A	5XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Gateway/Sala 9300 LS	2,848	PIII/700	256	64-544/50R	10.0/M	M	0/8	15.0/A	XGA	ATI/8	SW	E55/WT	Y/2	Y	56
Gateway/Sala 9300 XL	3,745	PIII/800	256	128-544/SDR	20.0/I	M	0/8	15.7/A	5XGA	ATI/8	HW	E55/WT	Y/2	Y	56
HP/OmniBook 500	3,499	PIII/700	256	128-512/50R	20.0/I	M	0/8	12.1/A	XGA	ATI/8	HW	58-Camp./FM	Y	Y	56
HP/OmniBook 6000	3,299	PIII/700	256	128-512/50R	10.0/I	M	0/8	14.1/A	XGA	ATI/8	HW	58-Camp./WT	Y/2	Y	56
HP/OmniBook XE3	2,149	PIII/700	256	64-256/SDR	10.0/I	I	0/8	14.1/A	XGA	53/4	SW	SB-Camp./WT	Y/2	Y	56
IBM/ThinkPad A21e FIU	2,049	PIII/750	256	64-512/50R	20.0/I	I	C/24	15.0/A	XGA	ATI/8	SW	58-Camp./♦	Y	Y	56
IBM/ThinkPad A21p	3,149	PIII/850	256	128-512/50R	32.0/I	I	0/8	15.1/A	UXGA	ATI/16	SW	58-Camp./♦	Y	Y	56
IBM/ThinkPad T20 41U	3,349	PIII/700	256	128-512/50R	12.0/I	I	D/6	14.1/A	SVGA	53/8	SW	CL/♦	Y	Y	56
IBM/ThinkPad T21 27U	2,249	PIII/750	256	128-512/50R	10.0/I	I	C/24	13.3/A	XGA	53/8	SW	58-Camp./♦	Y	Y	56
Itanium/GaBook	4,495	PIII/650	256	64-256/SDR	6.0/I	M	0	12.1/A	SVGA	53/8	SW	CL/♦	Y/2	Y	56
Itanium/X-C6250 Pro	5,995	GX/300	16	64-256/50R	6.0/I	M	0	10.4/A	SVGA	NM/4	SW	Cyrix/♦	Y	Y	56
Keydata/KeyNate 7060 A	2,245	PIII/650	256	128-512/50R	12.0/M	I	C/24	15.1/A	XGA	ATI/16	SW	E55/WT	Y/2	Y	56
M-Tech/20U	2,240	PIII/700	256	128-512/50R	12.0/M	M	0/8	13.3/A	XGA	ATI/8	HW	Crystal/WT	Y	Y	56
M-Tech/2893	2,280	PIII/700	256	128-256/SDR	20.0/I	I	0/8	15.1/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56
M-Tech/30W	2,600	PIII/750	256	128-512/50R	20.0/M	I	0/8	15.1/A	SXGA	ATI/16	HW	E55/WT	Y/2	Y	56
MA Labs/OecisionMaker 1009	2,025	PIII/700	256	128-256/50R	12.0/I	M	0/8	15.1/A	XGA	ATI/8	SW	Rackwell/WT	Y/2	Y	56
Mars/MarsPal 900A5	2,095	PIII/700	256	64-512/50R	10.0/I	I	0/8	15.1/A	XGA	ATI/8	SW	C-Media/FM	Y/2	Y	56
Mars/MarsPal 991A5	2,695	PIII/933	256	128-512/50R	20.0/M	M	0/8	15.1/A	5XGA	ATI/16	SW	ESS/WT	Y/2	Y	56
Max/MAX800K-N30-S80M3	2,199	PIII/800	256	128-512/SDR	12.0/M	I	C/24	15.1/A	XGA	ATI/16	HW	ESS/♦	Y/2	Y	56
Max Group/MaxNate 6120	2,170	PIII/850	256	64-256/50R	20.0/I	I	0/8	14.1/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	56
Max Group/MaxNate M7	2,052	PIII/600	256	64-192/50R	12.0/I	M	C/24	12.1/A	XGA	ATI/4	SW	Crystal/WT	Y	Y	56
MediaBook/920	2,355	PIII/650	256	64-512/SDR	10.0/M	M	C/24	15.1/A	XGA	ATI/16	SW	E55/WT	Y/2	Y	56
MediaBook/e-751	2,017	PIII/600	256	64-512/50R	6.0/M	M	C/24	14.1/A	SVGA	ATI/8	SW	A01/FM	Y/2	Y	56
Melard/Endura	4,799	PII/400	256	64-256/50R	10.0/M	M	C/24	12.1/A	SVGA	ATI/8	HW	Maestra/WT	Y/2	Y	56
Melard/Endura LE	2,799	PII/400	256	64-256/50R	10.0/M	M	D/6	14.1/A	XGA	ATI/8	HW	Maestra/WT	Y/2	Y	56
Melard/SCOUT 2	3,899	K6/233	256	64-64/50R	6.0/I	M	0	6.4/A	VGA	♦/2	SW	0	Y	Y	56
Micran/Transport Gx	2,499	CEL/650	128	64-512/50R	10.0/M	I	C/24	14.1/A	XGA	53/16	HW	E55/WT	Y/2	Y	56
Micran/Transport Gx+	2,749	PIII/700	256	64-512/SDR	10.0/M	I	C/24	15.1/A	SXGA	53/16	HW	ESS/WT	Y/2	Y	56
Micran/Transport LT	2,499	PIII/600	256	64-192/SDR	6.0/M	M	C/24	13.3/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	56

(•) included; () not included; (2) two included; (3) three included; (4) four included; (♦) information not available at press time. Please refer to the key on page 180 for an explanation of abbreviations used above.

Input/Output Interfaces													PC Cards	Input	Additional Features					Warranty
SERIAL	PARALLEL	EXTERNAL FDD	EXT. MONITOR	AUDIO LINE (In/Out)	S-VIDEO (In/Out)	COMPOSITE VIDEO (In/Out)	EXT. MICROPHONE	HEADPHONE/SPEAKER	MIDI/GAME	DOCKING STA./PORT REP.	INFRARED	USB	TYPE II/TYPE III SLOTS	ZOOMED VIDEO/CARDBUS	KEYBOARD/POINTING DEVICE	BATTERY: TYPE/LIFE (hrs.)	DIMENSIONS (WxDxH in.)	WEIGHT (lbs. w/ batt. incl.)	ADDITIONAL SYSTEM INFO & ACCESSORIES	
•	•	•	•	I/O	-	-	•	•	-	•	•	•	1/0	□/C	82-key/TP	Li-Ion/4	11.3 x 8.9 x 1.3	4.2	Win98	1-yr.
•	•	•	•	I	-	□	•	•	-	•	•	•	1/0	□/C	87-key/TP	Li-Ion/4	11.3 x 8.9 x 1.3	4.2	Win98, CD-RW	1-yr.
•	•	-	•	I/O	0	I	•	•	•	•	•	Ⓢ	2/1	Z/C	102-key/TP	Li-Ion/3	14.1 x 10.8 x 2.0	9.2	Win2000/Me, CD-RW, FireWire port	1-yr.
•	•	Ⓢ	•	I/O	0	-	•	•	•	•	•	•	2/0	Z/C	87-key/TP	Li-Ion/3	12.7 x 10.2 x 1.9	6.8	Win98/Me, CO-RW	1-yr.
•	•	□	•	I/O	0	I/O	-	•	•	-	•	Ⓢ	2/1	Z/C	88-key/PS/TP	Li-Ion/4-5	12.7 x 10.4 x 1.6	7.8	Win98, carrying cose	3-yr.
•	•	□	•	I/O	-	I/O	•	•	-	-	•	Ⓢ	2/1	Z/C	88-key/PS/TP	Li-Ion/4-5	13.2 x 11.3 x 1.6	8.6	Win2000, carrying cose, FireWire port	3-yr.
•	•	-	-	I	0	0	□	•	Ⓢ	□	□	•	1/0	Z/C	85-key/PS/TP	Li-Ion/3.5	11 x 8.7 x 1	3.5	Win2000	1-yr.
•	•	•	•	I/O	I	-	•	•	Ⓢ	□	•	•	2/0	Z/C	88-key/PS/TP	Li-Ion/3.5	12.4 x 10.4 x 1.3	5.0	Win2000	3-yr.
•	•	-	•	I/O	-	□	•	•	Ⓢ	□	•	•	2/1	Z/C	87-key/TP	Li-Ion/4	13 x 10.8 x 1.6	7.4	Win98	1-yr.
•	•	Ⓢ	•	I/O	I	-	•	•	-	•	•	•	1/1	Z/C	85-key/PS	Li-Ion/3	12.5 x 10.5 x 1.5	7.2	Win98	1-yr.
•	•	-	•	I/O	I/O	-	•	•	-	•	•	•	2/1	Z/C	85-key/PS	Li-Ion/4	13 x 10.5 x 1.5	7.9	Win98	3-yr.
•	•	-	•	I/O	-	-	•	•	Ⓢ	•	•	•	2/1	Z/C	85-key/PS	Li-Ion/4	12 x 9.8 x 1.3	5.2	Win98	3-yr.
•	•	Ⓢ	•	I/O	-	□	•	•	Ⓢ	•	•	•	2/1	Z/C	85-key/PS	Li-Ion/4	12 x 9.8 x 1.3	5.0	Win98	3-yr.
•	•	•	•	I/O	-	-	•	•	Ⓢ	•	•	•	1/1	Z/C	87-key/TP	Li-Ion/4	12 x 9.8 x 2.2	7.5	ruggedized magnesium cose	3-yr.
•	•	•	•	I/O	-	-	•	•	-	□	•	•	2/1	Z/C	87-key/PS	NiMH/3.5	10.5 x 7.5 x 3	6.9	Win9S/98/NT, ruggedized system	3-yr.
•	•	-	•	I/O	0	-	•	•	Ⓢ	•	•	•	2/1	Z/C	85-key/TP	Li-Ion/2.5	12.8 x 10.1 x 1.7	7.6	Win98	1-yr.
•	•	Ⓢ	•	I/O	-	-	•	•	Ⓢ	◆	•	•	2/1	Z/C	85-key/TP	Li-Ion/2.5	11.5 x 10 x 1	6.5	Win98, Stor Office Suite 5.2, carrying cose	1-yr.
•	•	□	•	I/O	-	-	•	•	Ⓢ	-	•	Ⓢ	1/0	Z/C	88-key/TP	Li-Ion/2	12.9 x 10.5 x 1.5	7.2	Win98, Stor Office Suite 5.2, carrying cose	3-yr.
•	•	-	•	I/O	0	-	•	•	□	•	•	Ⓢ	2/0	Z/C	88-key/TP	Li-Ion/3	12.7 x 10.2 x 1.7	7.2	Win98, Stor Office Suite 5.2, carrying cose	3-yr.
•	•	•	-	I/O	I/O	-	-	-	-	-	-	•	1/0	Z/C	84-key/TP	Li-Ion/2.5	12.8 x 10.5 x 1.5	6.6	carrying cose, FireWire port	1-yr.
•	•	-	•	0	-	0	•	•	Ⓢ	Ⓢ	•	Ⓢ	2/1	Z/C	85-key/TP	Li-Ion/2	12.6 x 10.7 x 1.5	7.2	WinMe, carrying cose	1-yr.
•	Ⓢ	-	•	I/O	0	I	•	•	□	•	•	Ⓢ	2/1	Z/C	102-key/TP	Li-Ion/3	14 x 10.8 x 1.9	9.9	WinMe, carrying cose, FireWire port	1-yr.
•	•	-	•	I/O	0	-	•	•	□	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/2	10.5 x 12.1 x 1.6	7.4	Win98, carrying cose	1-yr.
•	•	-	•	I/O	0	0	•	•	-	•	•	•	2/0	Z/C	86-key/TP	Li-Ion/3.5	12.6 x 10.1 x 1.5	6.9	Win98, carrying cose	1-yr.
-	-	•	•	0	-	-	•	•	-	•	•	•	1/0	Z/C	86-key/TP	Li-Ion/4.5	10.6 x 8.6 x .9	3.5	Win98, carrying cose, FireWire port	1-yr.
•	•	Ⓢ	•	I/O	I/O	I/O	•	•	□	•	•	•	1/0	Z/C	87-key/TP	Li-Ion/3	10.2 x 12.8 x 1.7	7.0	Win98	4-yr.
•	•	Ⓢ	•	-	-	-	•	•	-	-	•	•	2/2	Z/C	87-key/TP	Li-Ion/3	12.1 x 10.5 x 1.6	7.0	Win98	4-yr.
•	•	-	•	I/O	0	-	•	•	-	•	•	•	2/0	Z/C	87-key/TP	Li-Ion/3-4	12.2 x 10 x 2.8	12.2	Win95/98, FireWire port	1-yr.
•	•	Ⓢ	•	I/O	0	-	•	•	□	•	•	•	2/0	Z/C	87-key/TP	Li-Ion/3-4	12.2 x 10.1 x 1.6	7.5	Win95/98	1-yr.
•	•	□	•	-	-	-	-	-	-	-	□	-	2/0	-	64-key/TP	Li-Ion/8	9.2 x 6.5 x 2.8	5.5	Win95/98	1-yr.
•	•	Ⓢ	•	I/O	Ⓢ	0	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/3	12.7 x 10.7 x 1.6	7.0	Win2000	3-yr.
•	•	Ⓢ	•	I/O	□	0	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/3	12.7 x 10.7 x 1.6	7.0	Win2000	3-yr.
•	•	-	•	I/O	-	-	•	•	-	•	•	•	2/1	Z/C	88-key/TP	Li-Ion/3	12 x 9.5 x 1.5	4.8	Win98, MS Office SBE	3-yr.

(•) included; () not included; (2) two included; (3) three included; (4) four included; (♦) information not available at press time. Please refer to the key on page 180 for an explanation of abbreviations used above.

COMPARISON CHARTS

NOTEBOOKS OVER \$2,000

MAKE/MODEL	PRICE	CPU & Memory			Drives			Video System				Audio System			
		PROCESSOR/ CLOCK SPEED (MHz)	L2 CACHE (K)	MEMORY Std.-Max./TYPE	HARD DRIVE (GB)	FLOPPY DRIVE	ROM DRIVE TYPE/SPEED (X)	DISPLAY (in.)/TYPE	RESOLUTION	VIDEO CONTROLLER/ VIDEO MEMORY (MB)	MPEG SUPPT.	AUDIO CHIPSET/ SYNTHESIS	INT. SPEAKER	INT. MIC	MODEM (Kbps)
Micron/Transport LT	\$3,217	PIII/750	256	128-320/SOR	6.0/M	M	0/8	13.3/A	XGA	ATI/8	SW	ESS/WT	Y/2	Y	S6
NEC/Versa LXi	4,499	PIII/850	256	128-512/SOR	12.0/I	I	0/6	15.0/A	XGA	S3/16	HW	Intel/WT	Y	Y	S6
NEC/Versa SXi	2,299	PIII/850	256	128-512/SOR	20.0/I	M	C/40	14.1/A	XGA	ATI/8	HW	Maestro/WT	Y	○	S6
NEC/Versa VXi	2,799	PIII/750	256	128-256/SDR	20.0/I	I	0/6	14.1/A	XGA	ATI/4	HW	SB-Comp./WT	Y	Y	S6
Panasonic/Toughbook 28	4,599	PIII/600	256	128-192/SOR	12.0/M	M	○	13.3/A	XGA	SMI/4	HW	Yamaha/WT	Y	○	S6
Panasonic/Toughbook 34	3,184	PIII/400	256	64-192/SOR	20.0/I	M	C/24	8.4/A	SVGA	NM/2.5	SW	S8-Comp./FM	Y	○	S6
Panasonic/Toughbook 48	2,999	PIII/700	256	256-384/SOR	20.0/M	I	0/6	14.1/A	XGA	NM/8	SW	Yamaha/FM	Y/2	○	S6
Panasonic/Toughbook 72	3,599	PIII/700	256	128-192/SDR	20.0/I	M	C/24	13.3/A	XGA	SMI/4	SW	Yamaha/WT	Y/2	○	S6
PC Club/ENP-314@PIII+700M	2,399	PIII/700	256	320-320/SOR	12.1/I	I	0/8	14.1/A	XGA	ATI/8	SW	Crystal/WT	Y/2	Y	S6
PC Club/ENP-325@Mobile	2,399	PIII/850	256	128-512/SOR	10.0/I	I	0/8	15.1/A	XGA	ATI/16	SW	ESS/WT	Y/2	Y	S6
PC Club/ENP-362@U-Slim	2,099	PIII/750	256	128-192/SOR	10.0/I	M	C/24	12.1/A	XGA	ATI/4	SW	Crystal/WT	Y	Y	S6
PC Notebook/Jaguar 3 Elite	2,599	PIII/850	256	128-256/SOR	20.0/M	M	D/8	14.1/A	XGA	SIS/32	HW	SIS/WT	Y/2	Y	S6
PC Notebook/Panther 3M Pro	2,299	CEL/600	128	64-512/SOR	6.0/M	M	C/24	15.1/A	XGA	ATI/8	HW	◆/WT	Y/2	Y	S6
PC Notebook/Panther 3U	3,099	PIII/800	256	128-512/SDR	20.0/I	I	C/24	15.1/A	XGA	ATI/16	HW	ESS/WT	Y/2	Y	S6
PC Notebook/Travelcot 3 Exec	2,599	PIII/750	256	128-320/SOR	12.0/M	M	C/24	13.3/A	XGA	ATI/8	HW	ESS/WT	Y/2	Y	S6
Sceptre/Soundx 66002	2,149	PIII/800	256	128-512/SOR	10.0/M	I	C/24	14.1/A	XGA	ATI/16	SW	ESS/FM	Y/2	Y	S6
Sceptre/Soundx 69502	2,399	PIII/800	256	128-512/SDR	10.0/M	I	0/8	15.1/A	SXGA	ATI/16	SW	ESS/FM	Y/2	Y	S6
Sceptre/Soundx 7300	2,099	PIII/800	256	128-320/SDR	10.0/I	M	C/24	13.3/A	XGA	ATI/8	SW	Crystal/FM	Y/2	Y	S6
Sony/VAIO PCG-CIXS	2,299	PII/400	256	64-128/SDR	12.0/I	M	○	8.9/A	XGA	NM/2.5	SW	NM/◆	Y/2	Y	S6
Sony/VAIO PCG-FS80	2,999	PIII/650	256	64-256/SOR	12.0/I	I	0/8	15.0/A	XGA	NM/6	HW	S8-Comp./◆	Y	Y	S6
Sony/VAIO PCG-ZS0SJEK	2,699	PIII/500	256	64-192/SOR	9.0/I	I	○	12.1/A	XGA	NM/3	SW	S8-Comp./◆	Y/2	Y	S6
Toshiba/Portégé 3480CT	2,399	PIII/600	256	64-192/SOR	12.0/I	M	○	11.3/A	XGA	S3/8	SW	Yamaha/FM	Y	Y	S6
Toshiba/Portégé 7220CTe	2,499	PIII/650	256	64-320/SDR	12.0/I	M	0/6	13.3/A	XGA	S3/8	SW	ESS/FM	Y	Y	S6
Toshiba/Satellite 280S-S402	2,799	PIII/850	256	128-384/SOR	20.0/I	I	D/8	15.0/A	XGA	NV/16	SW	Yamaha/FM	Y/2	○	S6
Toshiba/Satellite Pro 4600	2,199	PIII/750	256	128-256/SOR	20.0/I	I	0/8	14.1/A	XGA	TR/16	SW	Toshiba/FM	Y/2	○	S6
Toshiba/Tecra 8100	3,999	PIII/850	256	256-512/SDR	20.0/M	M	0/8	14.1/A	XGA	S3/8	SW	Yamaha/FM	Y/2	Y	S6
Twinhead/A1000	2,120	PIII/700	256	128-256/SOR	10.0/I	M	C/24	12.1/A	SVGA	TR/2.5	HW	CL/WT	Y/2	Y	S6
Twinhead/A9110	2,370	PIII/750	256	128-512/SDR	10.0/I	I	C/24	14.1/A	XGA	SIS/8	HW	SIS/WT	Y/2	Y	S6
WinBook/Si 850 C0-RW	2,499	PIII/850	256	128-512/SDR	20.0/I	I	C/20	14.1/A	XGA	ATI/4	HW	ESS/WT	Y/2	Y	S6
WinBook/Si 850 OVO	2,199	PIII/850	256	128-512/SOR	10.0/I	I	D/8	14.1/A	XGA	ATI/4	HW	ESS/WT	Y/2	Y	S6
WinBook/Si ² 850	2,999	PIII/850	256	128-512/SOR	20.0/I	I	C/20	14.1/A	XGA	ATI/8	HW	ESS/WT	Y/2	Y	S6
Windriver/Compass 330	2,149	PIII/750	256	128-192/SOR	10.0/M	M	0/8	13.0/A	XGA	SMI/8	SW	SoundMax/WT	Y/2	Y	S6
Windriver/Navigator 430	2,549	PIII/800	256	128-192/SOR	20.0/M	M	0/8	14.1/A	XGA	S3/8	SW	SoundMax/WT	Y/2	Y	S6

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Input/Output Interfaces													PC Cards	Input	Additional Features					Warranty
SERIAL	PARALLEL	EXTERNAL FDD	EXT. MONITOR	AUDIO LINE (In/Out)	S-VIDEO (In/Out)	COMPOSITE VIDEO (In/Out)	EXT. MICROPHONE	HEADPHONE/SPEAKER	MIDI/GAME	DOCKING STA./PORT REP.	INFRARED	USB	TYPE II/TYPE III SLOTS	ZOOMED VIDEO/CARDBUS	KEYBOARD/POINTING DEVICE	BATTERY: TYPE/LIFE (hrs.)	DIMENSIONS (WxDxH in.)	WEIGHT (lbs. w/ batt. incl.)	ADDITIONAL SYSTEM INFO & ACCESSORIES	
•	•	•	•	I/O	•	•	•	•	•	•	•	•	2/1	Z/C	88-key/TP	Li-Ion/3	12 x 9.5 x 1.5	4.8	WinMe, MS Office S8E	3-yr.
•	•	•	•	I/O	I/O	•	•	•	•	•	•	•	2/1	Z/C	83-key/TP	NiMH/◆	12.8 x 9.8 x 1.9	8.2	LANOesk Client Monager 6.0	3-yr.
•	•	•	•	I/O	I/O	•	•	•	•	•	•	•	2/1	Z/C	83-key/TP	Li-Ion/◆	12.1 x 9.9 x 1.5	6.6	CD-RW, LANOesk Client Monager 6.0	3-yr.
•	•	•	•	I/O	I/O	•	•	•	•	•	•	•	2/1	Z/C	83-key/TP	NiMH/◆	12 x 9.8 x 1.6	7.0	LANOesk Client Monager 6.0	3-yr.
•	•	•	•	I/O	I/O	•	•	•	•	•	•	•	2/1	Z/C	87-key/TP/TS	Li-Ion/3-5	11.9 x 9.7 x 2.6	9.0	Win95/98/NT, ruggedized system	3-yr.
•	•	•	•	I/O	I/O	•	•	•	•	•	•	•	2/0	Z/C	87-key/TP	Li-Ion/4	9 x 7.4 x 1.7	3.8	Win95/98/NT, ruggedized system	3-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	②	2/1	Z/C	87-key/TP	Li-Ion/3.5	12.1 x 10 x 1.8	6.8	Win95/98/NT, ruggedized system	3-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/3.5	11.7 x 9.5 x 1.7	6.1	Win95/98/NT, ruggedized system	3-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/1	Z/C	88-key/TP	Li-Ion/4	12.1 x 10.1 x 1.5	6.9	Win98, carrying cose	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/1	Z/C	87-key/TP	Li-Ion/3.5	12.8 x 10.2 x 1.6	7.4	Win98 SE, MS Works, carrying cose	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	④	1/1	Z/C	85-key/TP	Li-Ion/2	11.2 x 10.2 x 9.1	3.4	WinMe, MS Works, magnesium-alloy casing	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	②	1/1	Z/C	87-key/TP	Li-Ion/2-3	12.4 x 10 x 1.5	6.5	Win98	1-yr.
•	•	•	•	I/O	•	0	•	•	•	•	•	②	2/1	Z/C	86-key/TP	Li-Ion/3	12.6 x 10.7 x 1.5	6.8	Win98	3-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	87-key/TP	Li-Ion/3	12.7 x 10.2 x 1.7	7.3	Win98	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	1/1	Z/C	85-key/TP	Li-Ion/2.5	12.1 x 9.5 x 1	3.9	Win98	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/0	•/C	87-key/TP	Li-Ion/3	12.8 x 10.2 x 1.5	7.6	Win2000, FireWire port	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/0	•/C	87-key/TP	Li-Ion/2.5	12.8 x 10.2 x 1.7	7.6	WinMe	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	1/0	•/C	87-key/TP	Li-Ion/2	12.1 x 9.5 x 1	4.2	Win98	1-yr.
•	•	•	•	I/O	•	0	•	•	•	•	•	•	1/0	•/C	◆/PS	Li-Ion/2	9.8 x 6 x 1.1	2.2	Win98, MS Word 2000, carrying case	1-yr.
•	•	•	•	I/O	I/O	0	•	•	•	•	•	•	2/1	•/C	86-key/TP	Li-Ion/2-3	12.8 x 10.5 x 2.1	7.7	Win98, MS Word 2000	1-yr.
•	•	•	•	I/O	I/O	•	•	•	•	•	•	•	1/0	•/C	83-key/TP	Li-Ion/1.5	10.8 x 8.9 x 1.2	3.8	Win2000, MS Word 2000	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	•	2/1	•	85-key/PS	Li-Ion/2.5	10.3 x 9.1 x .8	3.4	Win2000	1-yr.
•	•	•	•	0	0	•	•	•	•	•	•	•	2/1	•/C	85-key/PS	Li-Ion/3	11.7 x 9.9 x 1	4.8	Win98, 2nd battery	3-yr.
•	•	•	•	0	•	I/O	•	•	•	•	•	②	2/1	•/C	85-key/PS	Li-Ion/2	12.9 x 10.9 x 1.6	7.6	WinMe, Lotus SmartSuite Millennium	1-yr.
•	•	•	•	•	•	I/O	•	•	•	•	•	•	2/1	•/C	85-key/PS	Li-Ion/2	12.6 x 10.8 x 1.8	7.2	Win98, MS Explorer, McAfee ActiveShield	1-yr.
•	•	•	•	I/O	0	0	•	•	•	•	•	•	2/1	•/C	85-key/PS	Li-Ion/3	12.3 x 10 x 1.4	5.6	Win2000	1-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	③	1/0	Z/C	87-key/TP	Li-Ion/3	11.5 x 9.5 x 1	3.5	Win98, carrying cose	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	85-key/TP	Li-Ion/3	12.5 x 10.3 x 1.6	7.0	Win98, Webcam, carrying cose	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	87-key/TP	Li-Ion/2-3	12.2 x 9.6 x 1.5	7.1	Win2000/Me, CD-RW	3-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	87-key/TP	Li-Ion/2-3	12.2 x 9.6 x 1.5	7.1	WinMe	3-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	87-key/PS/TP	Li-Ion/2-3	12.2 x 9.6 x 1.5	7.1	Win2000/Me, CO-RW	3-yr.
•	•	•	•	I/O	•	•	•	•	•	•	•	•	2/1	Z/C	88-key/TP	Li-Ion/3.5	11.6 x 9.1 x 1.5	6.1	WinMe, MS Works 2000	1-yr.
•	•	•	•	I/O	0	•	•	•	•	•	•	②	2/1	Z/C	88-key/TP	Li-Ion/3	12.2 x 10 x 1.3	6.4	WinMe, MS Works 2000	1-yr.

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CHART KEY

GENERAL:

- included
- not included
- ② two included
- ③ three included
- ④ four included
- ♦ information not available at press time

SCREEN TYPE:

- A active matrix
- P passive matrix
- H high performance addressing (HPA)

DRIVES:

- C CD-ROM
- D DVD-ROM
- E external
- I integrated
- M modular

VIDEO CONTROLLERS:

- CL Cirrus Logic
- C&T Chips & Technologies
- NM NeoMagic
- SMI Silicon Motion, Inc.
- TR Trident

AUDIO SYSTEM:

- FM Frequency Modulation
- SB-Camp. Sound Blaster compatible wavetable
- WT

POINTING DEVICE:

- PS pointing stick
- TB trackball
- TP touchpad
- TS touchscreen

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